CHAPTER

73

ENGINE FUEL AND CONTROL

FUEL

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The List of Effective Pages records not only each page of subject revision but also each previously issued page which is still current. Blank pages and pages which are no longer current do not appear on this list. If there is any question about the currency of the maintained copy, it is recommended that each page of the manual be checked off against this List of Effective Pages. Any page which does not check out with this list, either by number or by date, shall be discarded. This list is reissued in its entirety whenever this manual section is revised.

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TO: RECIPIENTS OF JT12 OVERHAUL MANUAL, PART NUMBER 435108

REVISION NO. 75 DATED MAY 1, 2008

HIGHLIGHTS - FUEL

CHAPTER/ SECTION	PAGE NO	DESCRIPTION OF CHANGE	EFFECT OF CHANGE
73-00-00 ACCY	1156 1196N 1196S -1196T	Revised fuel procedures text. (Editorial)	-ALL

R 1. Fuel Components - General

R A. General

R (1) In this section are procedures for Disassembly,
R Cleaning, Inspection, Repair, Assembly, and Test of fuel
R components for the JT12/JFTD12 engine.

2. Fuel Differential Fluid Pressure Switch

NOTE: The fuel differential fluid pressure switch (pressure warning switch) has no parts or materials for which periodic replacement is necessary. Disassemble the switch only if a major adjustment is necessary, or if there is a defect in parts or if they are worn and replacement becomes necessary.

Refer to Tool Group A1.

A. Disassembly

See Figure 1101.

(1) Remove the test port screw (1) from the base.

(2) Remove the three cover hold-down screws (2), three washers (3), and three packings (4) and washers (5) from the cover (6).

NOTE: Unless there is obvious physical damage to the receptacle (8), do not remove the receptacle from the cover (6).

(3) Lift the cover, receptacle assembly attached, from the pilot switch assembly (13). Do not remove the receptacle lead wires.

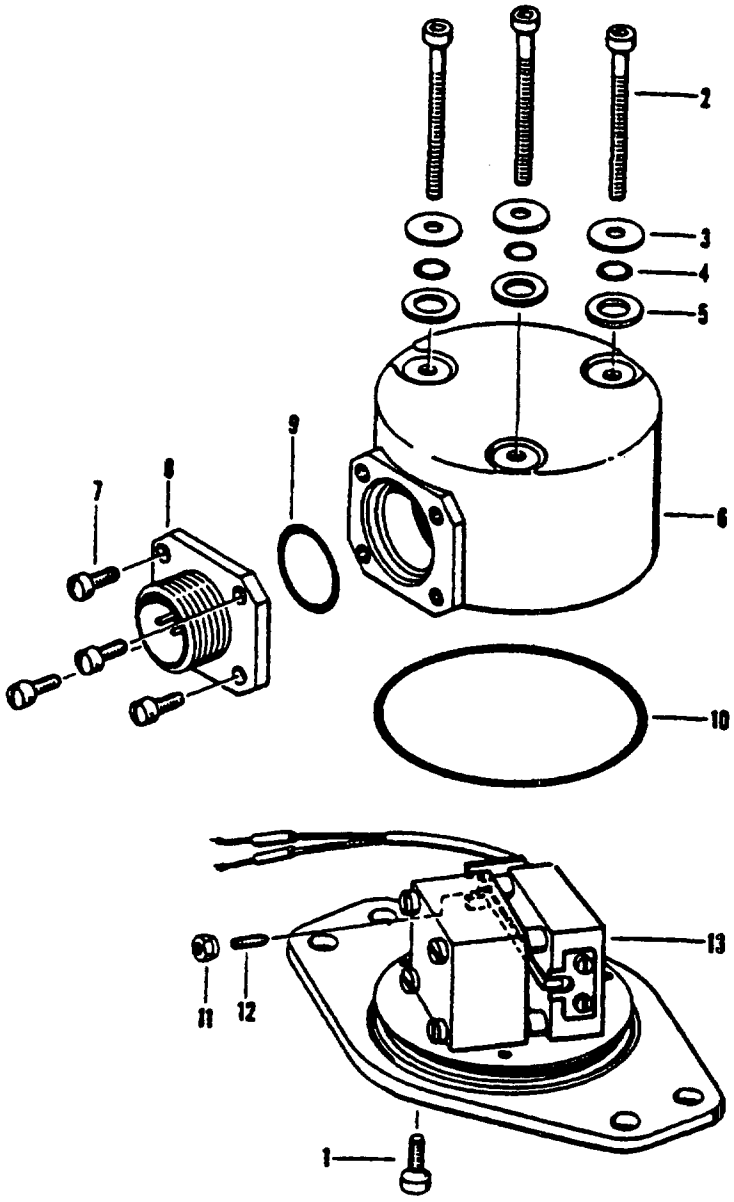
B. Cleaning

(1) The interior of the switch assembly must be free from dirt, grease, and foreign particles.

C. Inspection

(1) Examine the pressure switch assembly for damaged or worn parts.

(2) Replace the cover sealing gasket if there is swelling or distortion.



ORIGINAL
As Received By
ATP

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1. Test Port Screw
2. Hold-Down Screws
3. Washers
4. Packings
5. Washers
6. Cover
7. Mounting Screws
8. Receptacle
9. Gasket
10. Gasket
11. Locknut
12. Adjusting Screw
13. Pilot Switch

Key to Figure 1101

(3) Examine the receptacle for damaged or missing threads, bent pins, or frayed lead wires.

D. Repair

(1) If the receptacle (8) is damaged and it is necessary to replace it, cut the lockwire and remove the four receptacle mounting screws (7).

(2) Melt the solder that attaches the lead wires and remove the receptacle from the cover.

E. Assembly

(1) If the adjusting screw (12) and locknut (11) were replaced, do not apply GE No. 1201 Glyptol (red) to the locknut until the leak test of the pilot switch (13) is completed.

NOTE: Refer to Section 70-12-00 General-08 in the Standard Practices Manual for sources of Glyptol cement.

(2) If the cover sealing gasket (10) was removed, replace it (before you do this apply a thin, even coat of Dow Corning Hi-Vac silicone grease to the gasket).

(3) Replace the cover (6) loosely on the pilot switch assembly (13) and put the lead wires through the receptacle opening in the cover.

(4) Apply a thin coat of silicone grease to the gasket and and assemble the receptacle sealing gasket (9) to the receptacle (8).

(5) Install the receptacle (8) on the boss of the cover (6) and make sure that the receptacle keyway is in the correct position.

NOTE: Use the procedure that follows to make sure that the lead wires are in the correct position and are sufficiently protected, and to prevent unusual stress on the receptacle pins when the cover is installed on the pilot switch assembly.

(6) As the lead wires go out from the solder pots in the receptacle, they must go upward at right angles and then across the top of the pressure element.

(7) Put the cover on the switch assembly and bring the lead wires across the pressure elements. Before the cover comes down on the pilot switch, install the cover hold-down screw (2) with the washer (3), packing (4) and washer (5) through the cover mounting hole immediately opposite the receptacle.

(8) Point the screw toward the base plate (make sure that the receptacle wires are toward the screw and cover).

(9) Before the cover engages the base plate groove, turn the cover 15 degrees in a clockwise direction. Push the cover down into position and turn in a counterclockwise direction to its correct position. Install the remaining cover hold-down screws, washers, packings, and washers. Tighten the screws (2) to 18 - 20 lb-in. and safety them with lockwire.

(10) Remove the moisture from the unit and evacuate the case cavity (refer to Testing) and then install the test port screw.

F. Testing

(1) Equipment Necessary

(a) Flow bench that can supply fuel system calibration fluid at pressures as high as 150 psig.

(b) Two pressure regulating valves that can set pressures to as much as 150 psig, and two shutoff valves that can operate with pressures as high as 150 psig. See Figure 1102.

(c) Two pressure gages that can measure differential pressures from 5 - 150 psig and are accurate to plus or minus 2 psi.

(d) A differential pressure gage that can measure differential pressures from 1 - 10 psi plus or minus 0.1 psi and is accurate to plus or minus 0.1 psi across a base pressure range from 0 - 150 psig.

(e) An electrical circuit that is a 24 volt DC or 110 AC source with an explosion-proof indicator light, and a MS3106-12S-3S or MS3108-12S-3S connector mating with the pressure switch.

(f) A holding adapter.

NOTE: Install the switch with the base in a horizontal plane.

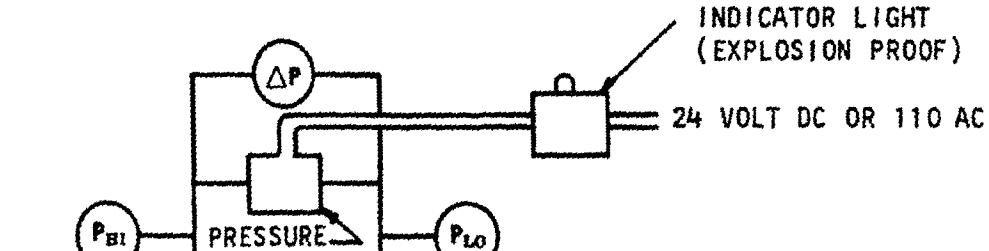
(2) Calibration Procedure

(a) If overhaul of the switch makes it necessary to replace the adjusting screw (12) and locknut (11), set the unit as follows:

1 Install the new adjusting screw and locknut. Engage the screw until the snap switch makes a click sound. Then turn the screw back out one-half turn in a counter clockwise direction. Tighten the locknut fingertight but not wrench-tight.

2 Connect the switch as shown in Figure 1102.

(b) To set the Increasing Differential Pressure value, increase the pressure on the HI and LO ports to 50 psi and hold. Then slowly decrease the pressure on the LO port from 50 - 40 psi and record the point on the gage at which the circuit closes. This is the Increasing Differential Pressure value. Do a pressure reading check at the minimum and maximum ends of the pressure range as follows:



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Differential Fluid Pressure Switch
Test Schematic
Figure 1102

1 Increase the pressure in the HI and LO ports to 30 psi and hold. Slowly decrease the pressure in the LO port from 30 - 20 psi and record where the circuit closes.

2 Do the check again and hold the pressure in the two ports at 100 psi, then decrease the pressure in the LO port from 100 - 90 psi.

(c) Adjust the Increasing Differential Pressure value:

1 If the Increasing Differential Pressure value is too high (more than 6.7 - 8.0 psi), turn the adjusting screw in a clockwise direction until the value is as specified (do this at the 50 psi level). Then do a check of the Increasing Differential Pressure as specified above, at the 30 psi and 100 psi levels.

2 If the Increasing Differential Pressure value is too low (less than the specified tolerance of 6.7 - 8.0 psi), turn the adjusting screw counterclockwise until the value is as specified (do this at the 50 psi level, then do a check at the 30 psi and 100 psi levels).

(d) Decreasing Differential Pressure Check

1 Hold pressure in the HI and LO ports at 50 psi, then decrease the pressure in the LO side to 40 psi until the light goes on. Then increase the pressure in the LO side from 40 - 50 psi and record the point at which the light goes out. The circuit must open (light goes out) during Decreasing Differential pressure at 1.0 - 3.5 psi less than the light-on pressure.

(e) Bring the pressure in the two ports to zero psi and increase, then decrease the pressure in the two ports at the same time from zero to 150 psi to zero psi, ten times. Hold the pressure in the two ports at 150 psi, then tap the pressure element with a one-ounce plastic hammer. Do a check of the readings again.

NOTE: Do not apply Glyptol to the locknut (11) until the leak test of the pilot switch assembly (13) in this section is completed.

R
R

(f) If overhaul of the switch makes it necessary to replace the pilot switch assembly (13), cover (6), and/or receptacle (7), do the calibration check as specified in this section after switch assembly is completed.

(g) To replace the pilot switch assembly (13), remove four screws from the flange and separate the switch assembly. Put the replacement switch assembly with assembly on the flange, install four screws and torque them as specified in Table of Limits, Reference 1032.

(3) Pilot Switch Assembly Leak Check

NOTE: Remove the cover (6) from the pilot switch (13) before this check.

(a) Install the switch assembly on an applicable fixture and apply 400 psi air pressure to the two HI and LO ports at the same time.

R (b) Put the full pilot switch assembly (13) in a
R solvent specified by SPOP 6. Refer to Section 70-21-00 in the Standard Practices Manual. Look for leakage.

(c) If leakage is apparent from either bellows, or it is possible to see it around the pushrods in each pressure element, replace the pilot switch assembly (13).

(d) If no leakage is seen, install the switch assembly in the calibration test stand and do the calibration checks in step (2).

(4) Assembled Switch Leak Check

NOTE: Install the cover (6) on the pilot switch (13) as specified in this section before this check.

(a) Make sure that the test port screw (1) is removed.

(b) Put the switch assembly on an applicable fixture and apply 150 psi air pressure to the two HI and LO ports at the same time, and to the inside of the case through the test port holes, and hold.

(c) Put the unit fully into clear water at room temperature and look for leakage.

(d) If leakage occurs around the cover, look for a sealing gasket (10) in bad condition. To correct this, replace the gasket (first apply a thin layer of silicone grease).

NOTE: Foreign material around the seat on the base plate can also cause leaks. Clean the base plate fully, put the cover back on, and do the leak check again.

(e) If leakage is seen around the cover hold-down screws (2), replace the packings (4) and washers (5).

(f) If leakage occurs around the receptacle, it is usually because of a defect in the receptacle sealing gasket (9). Replace the gasket (first apply a thin layer of silicone grease).

(g) If leakage occurs around the receptacle pins, it is usually because of tension on the pins. This tension is because the lead wires were incorrectly prepared for installation (it is important to remove insulation and get lead wire strands into shape correctly). Remove the cover and connect the wires as specified in this section.

(5) Switch Assembly Moisture Removal

(a) Make sure that the test port screw (1) is removed.

(b) Put the switch assembly in an evacuation oven with the test port hole open. Evacuate the unit to 5 mm Hg or less for one hour at 121°C (250°F).

(c) Bring the unit back to sea level conditions and remove it from the oven.

(6) Evacuation and Filling

(a) Equipment necessary

NOTE: It is permitted to use equivalent substitutes.

1 High pressure regulator Model 9Z-AR100, multi-stage, and low pressure regulator set at 5 - 10 psi, available from Harris Calorific Co., 5501 Cass Ave., Cleveland, OH 44101 USA.

2 Two manometers with a range of 0 - 30 inches Hg (available from Meriam Process Technologies, (formerly Meriam Instrument Co., Division of Scott Fetzer Co.), 10920 Madison Ave., Cleveland, OH 44102 USA).

3 Nine needle valves Model 5102, available from Anderson Greenwood Instrumentation, 3950 Greenbriar Drive, Stafford, TX 77477 USA.

4 Pressure switch mounting manifold (local manufacture)

5 Ten-micron filter (commercially available)

6 Stainless steel reservoir of approximately 450 cubic inches in volume (commercially available)

7 Stainless steel overflow trap with sight gage, approximately 225 cubic inches in volume (commercially available)

8 Fill-cycle vacuum pump and evacuation-cycle vacuum pump (commercially available)

(b) Procedure

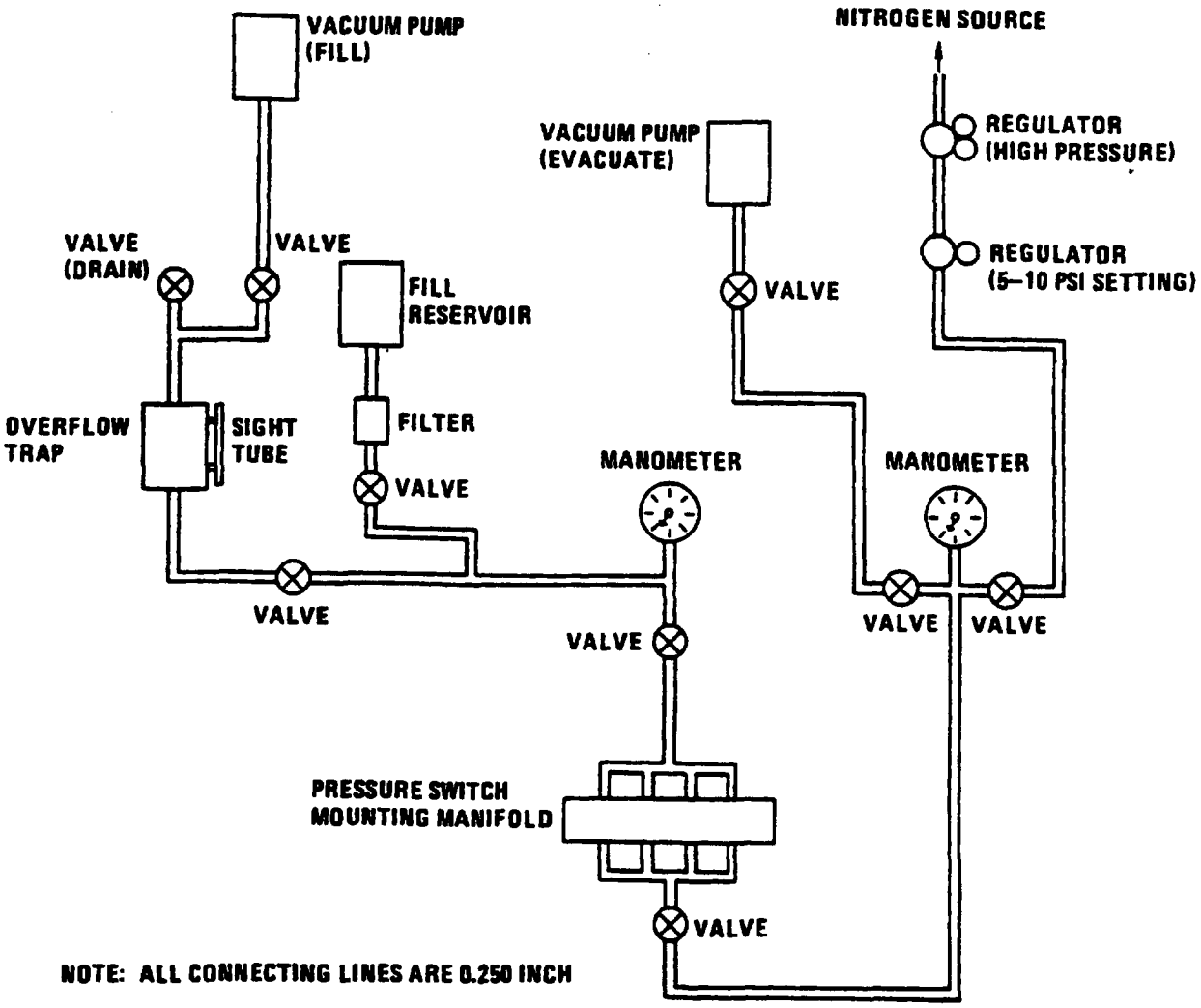
See Figure 1101 and Figure 1103.

NOTE: Make sure that screw (1) in Figure 1101 is not installed in the test port.

1 Connect the switch to the vacuum stand manifold as shown in Figure 1103.

2 Evacuate the test cavity at the test port to 28 inches Hg or more for a one minimum of one minute.

3 During case cavity evacuation, evacuate the HI and LO ports for three to five minutes.



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Differential Fluid Pressure Switch
Evacuation And Filling Schematic
Figure 1103

CAUTION: IF ENGINE FUEL GETS INTO THE TEST PORT (OR IS ADJACENT TO IT), IT WILL BE NECESSARY TO DISASSEMBLE THE SWITCH, CLEAN IT, ASSEMBLE IT, AND DO THE EVACUATE-AND-FILL PROCEDURE.

4 De-energize the evacuation system to the pressure element ports and back-fill with engine fuel to one atmosphere.

5 De-energize the evacuation system to the case cavity (test port) and back-fill with pre-purified Grade 99.997% minimum purity nitrogen to one atmosphere.

6 Apply cement, GE No. 1201 Glyptol Red or equivalent, to the head and adjacent two threads of screw (1) in Figure 1101.

NOTE: Refer to Section 70-12-00, General-08 in the Standard Practices Manual for sources of Glyptol cement.

(7) Final Calibration

(a) Put the unit back on the calibration test stand and connect it electrically. Do checks again of Increasing and Decreasing Differential Pressure readings. If readings make it necessary to adjust the switch internally, do the full test again.

(b) Clean the receptacle threads and apply a thin layer of silicone grease. Put the cover back on and put the switch on a shipping board to protect the pressure ports.

(8) Troubleshooting

(a) Refer to Table 1101.

Trouble	Probable Cause	Remedy
High Increasing Differential Pressure Reading	Worn adjusting screw (12)	Replace screw (12) and locknut (11)

Trouble	Probable Cause	Remedy
Circuits do not operate	Worn adjusting screw (12)	Replace screw (12) and locknut (11)
	Blockage of pressure ports	Flush ports. Replace switch (13) if flush does not correct the problem.
A-B Circuit always open	Short circuit in lead wires (because of incorrect cover assembly)	Repair or replace wiring.

Differential Fluid Pressure Switch
Troubleshooting
Table 1101 (Continued)

(9) Storage

(a) Install fluid pressure switches on a shipping board to protect pressure ports.

(b) Install a protective cover on the switch electrical connector.

(c) Keep switches in a cool, dry location.

3. Fuel Deicing Heater

NOTE: Refer to Tool Group A3.

A. Disassembly

See Figure 1104.

NOTE: Discard all gaskets, packings, and seals during disassembly.

(1) Remove the rod from the rear cover of the fuel deicing heater.

(2) Remove the rear cover from the heater.

(3) Remove the front cover from the heater, and remove the metering plate from the cover.

R
R

CAUTION: DO NOT BEND OR TWIST THE CORE, OR GIVE IT FORCE OR MOVEMENT WHICH COULD CAUSE DAMAGE TO THE TUBES OR CONNECTIONS.

(4) Use an arbor press against the front end of the heater to push the core rearward out of the heater housing.

(5) Remove the bolts that hold the bushing in position and pull the bushing from the housing.

(6) Remove the spacer sleeves from the brackets.

B. Cleaning

R (1) Clean all heater parts by SPOP 209. Refer to Section
R 70-21-00 in the Standard Practices Manual.

(2) Dry the parts by clean compressed air blast.

C. Inspection

(1) Examine the heater body, covers, and elbows for cracks, dents or damage which it is not possible to repair.

(2) Examine all sealing surfaces for nicks and scratches.

(3) Examine the core for misalignment, distortion, dents in tubes, or breaks in welds.

(4) Measure the heater rear cover for bore wear. If the bore diameter is not in the limits of 1.873 - 1.877 inches, repair it as specified in Repair.

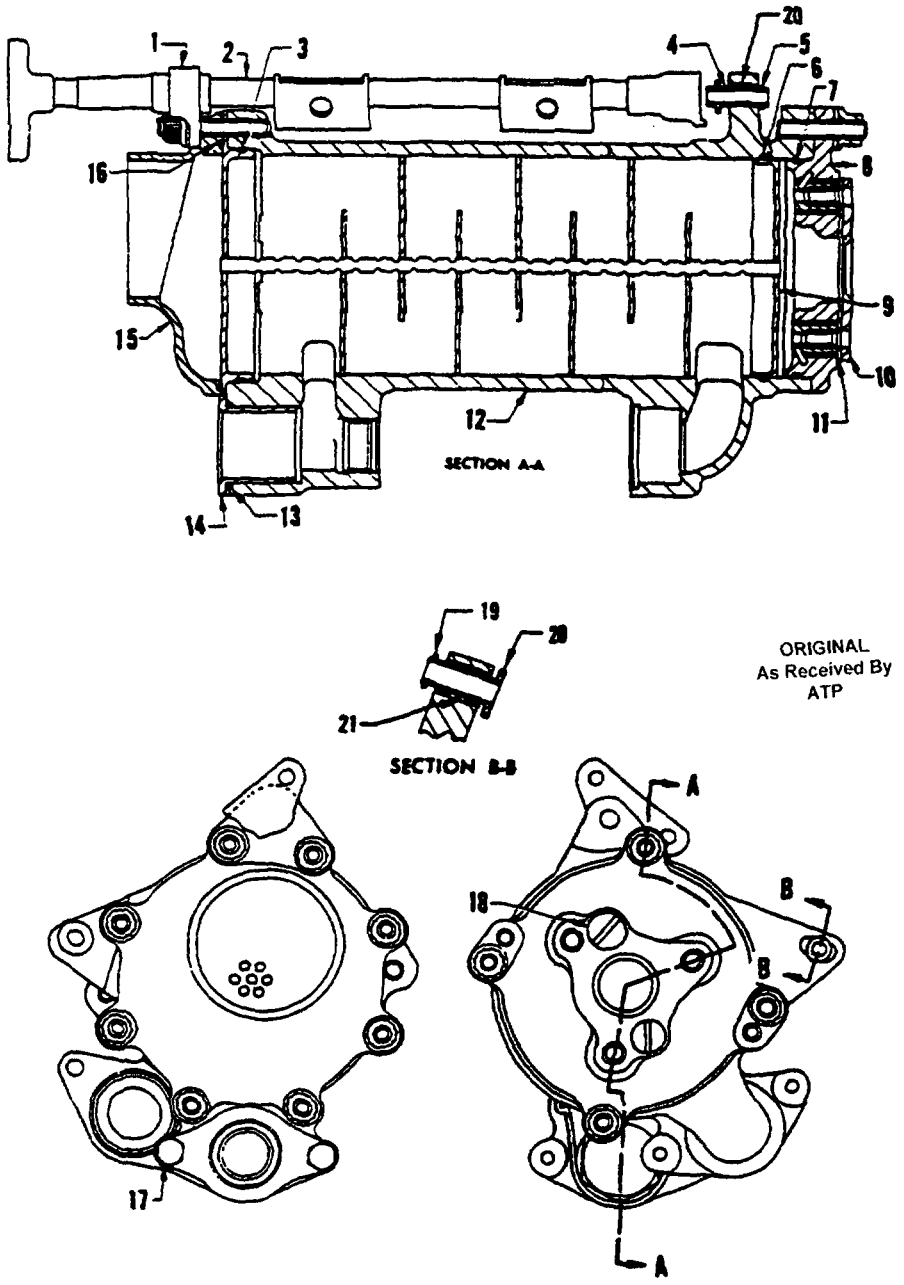
(5) Examine the mounting sleeve bushing for wear or damage and repair as necessary (refer to Repair). Measure the bushing ID. The maximum bushing ID permitted is 0.285 inch.

D. Repair

R (1) Housing Stud Replacement

R See Figure 1105.

R (a) Replace broken or damaged studs by SPOP 416. Refer
R to the figure for projection length limits. Refer
R to Section 70-00-00 in the Standard Practices
R Manual.



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R
R

Fuel Deicing Heater
Figure 1104

EFFECTIVITY -ALL

1. Bracket
2. Rod
3. Packing
4. Spacer Sleeve
5. Retaining Ring
6. Packing
7. Packing
8. Front Cover
9. Core
10. Metering Plate
11. Gasket
12. Housing
13. Packing
14. Bearing
15. Rear Cover
16. Gasket
17. Bolt
18. Screw
19. Retaining Ring
20. Spacer Sleeve
21. Sleeve Bushing

Key To Figure 1104

R (2) Front Cover Insert Replacement

R See Figure 1106.

R NOTE: Refer to Tool Group A3.

R (a) Machine out damaged inserts.

R (b) Use the Insert Driver to install new inserts,
R 0.000 - 0.030 inch below the part surface.

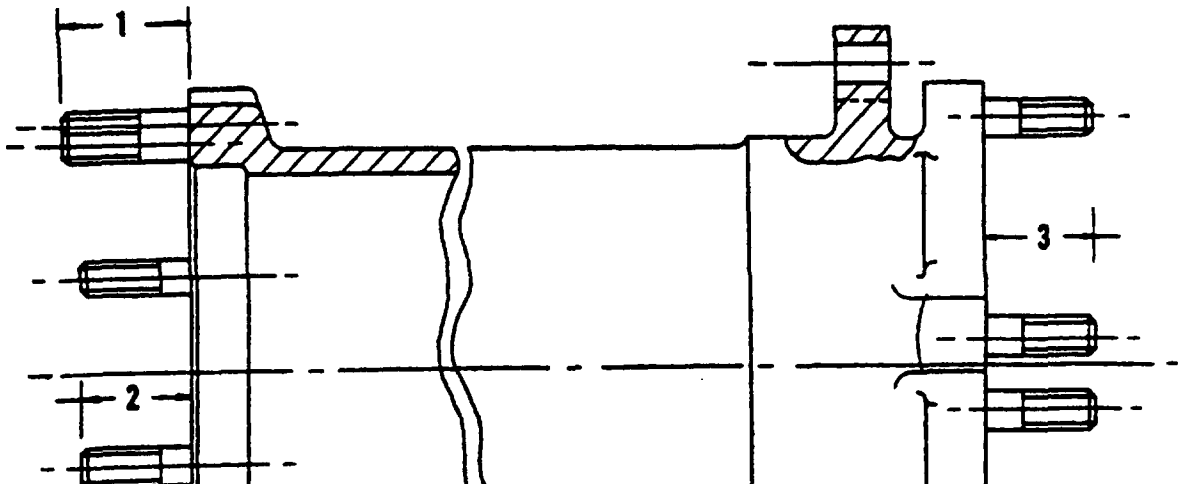
R (c) With the Insert Drill Jig, drill a hole for a new
R pin (keep away from the old pin position), 0.060 -
R 0.062 inch diameter.

R (d) With the Pin Drift install a new pin in the pin
R hole and stake it in position.

(3) Rear Cover Bore Repair

See Figure 1107.

(a) If bore wear of the heater rear cover is more than the permitted limits, repair the cover as follows:



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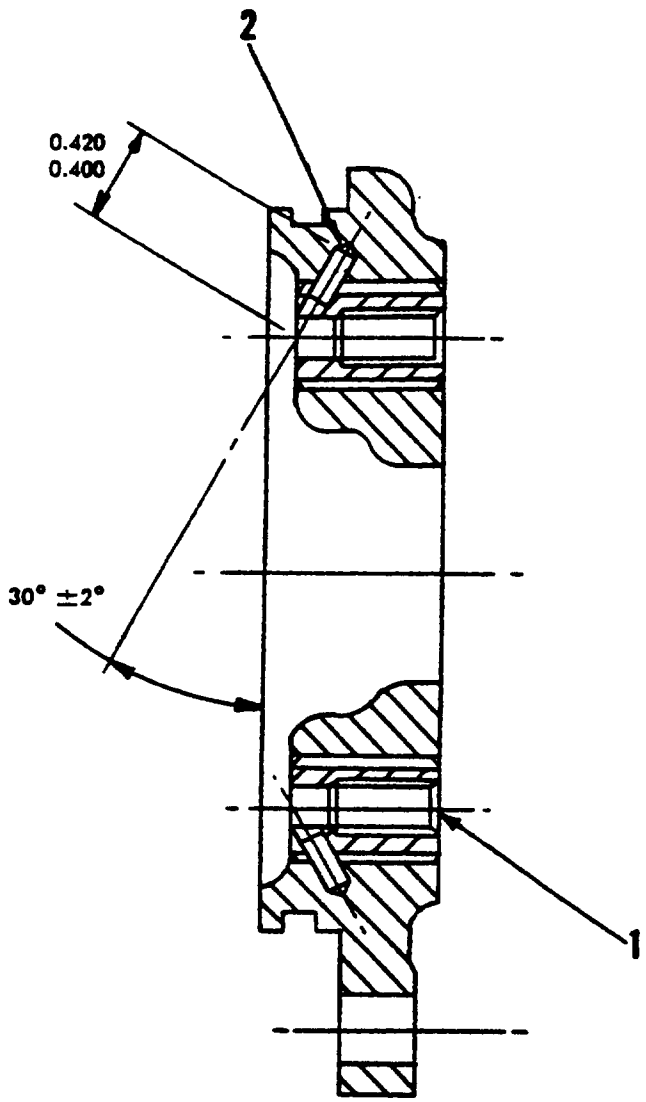
Index No.	Part Name	Units Per Assy	Projection Length
1.	Stud	2	0.990 - 1.010 Inch
2.	Stud	6	0.865 - 0.885 Inch
3.	Stud	4	0.865 - 0.885 Inch

R
R

Fuel Deicing Heater
Housing Stud Replacement
Figure 1105

EFFECTIVITY -ALL



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1. Insert (3)
2. Pin (3)

R 1 Remove the chromium plate (refer to SPOP 22 in
R Section 70-44-01 in the Standard Practices
R Manual).

2 Machine the bore in the cover to remove worn areas.

3 If the machining operation increases the bore diameter by 0.020 inch or less, plate as follows:

R a Chromium plate by SPOP 22 (0.001 - 0.010 inch
R of plate must be remaining after the grinding operation). Refer to Section
R 70-44-01 in the Standard Practices Manual.

b Grind the bore to the dimension specified in the figure.

R c Bake the cover at 391° - 407°C (735° - 765°F)
R for two hours.

R 4 If the machining operation increases the bore
R diameter by more than 0.020 inch:

R a Nickel-plate by SPOP 26 (0.010 - 0.025 inch
R of plate must be remaining after the nickel
R plate is machined). Refer to Section
R 70-44-01 in the Standard Practices Manual.

R b Machine the bore to prepare for chromium
R plate.

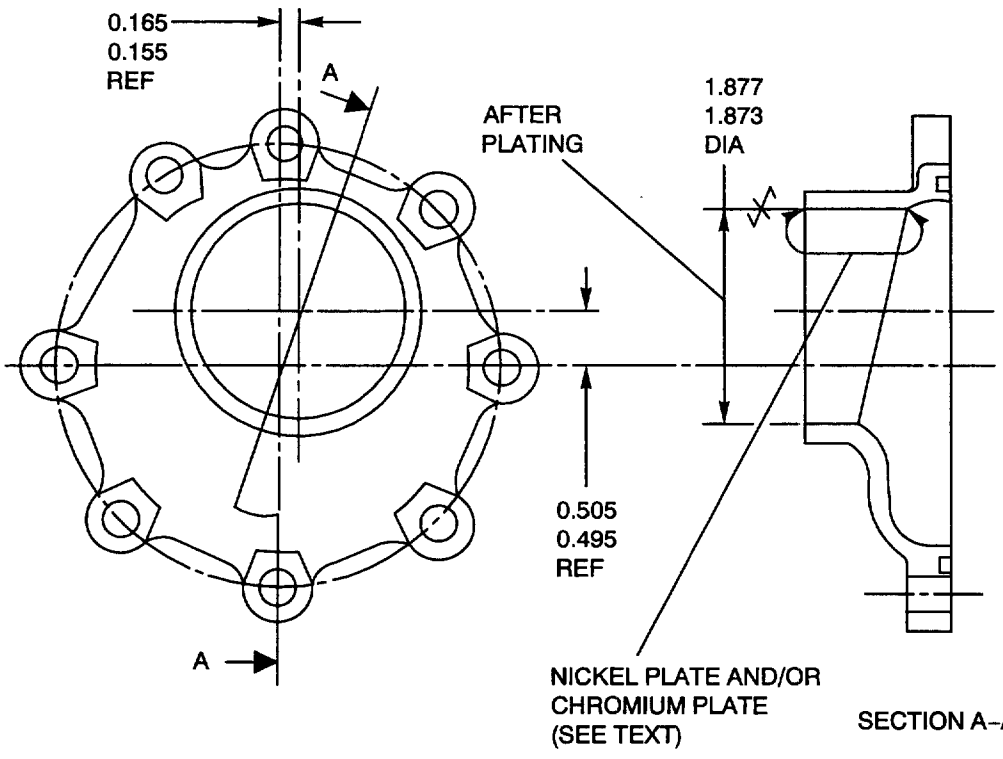
R c Chromium plate by SPOP 22 (0.001 - 0.005 inch
R of plate must be remaining after the final
R grinding operation). Refer to Section
R 70-44-01 in the Standard Practices Manual.

R d Grind the bore to the final dimensions.

R e Bake the cover at 391° - 407°C (735° - 765°F)
R for two hours.

(4) Fuel Heater Core Tube Plug Repair

NOTE: A maximum of six tubes can get the plug repair if cracks occur.



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PW V

(a) Fully clean the ID of the tubes for which braze repair of plugs will be necessary. A satisfactory first cleaning operation is to use a rolled piece of No. 120 abrasive cloth turned in the tube ID until the area that will get the plug is bright.

R R R (b) Degrease the tube assembly after this polishing operation by SPOP 209. Refer to Section 70-21-00 in the Standard Practices Manual.

(c) Drill a 0.040 inch diameter hole 0.8125 inch from either end of the tube at an available position around the tube circumference.

(d) Apply AMS 3410 or AMS 3411 flux to PN 403388 plug and to tube ID.

NOTE: The plug has a step. The plug is available in 14 classes. The difference between classes for the major diameter (that will have the specified fit with the tube ID) is 0.0005 inch.

(e) Install plugs that have a 0.000 - 0.001T inch fit with the larger diameter toward the tube center. Push the plug 0.0625 inch below flush with the end surface of the tube.

(f) Apply a large quantity of flux to all of the end plate (make sure that there is flux on all tube ends).

R R (g) Braze by AMS 2664. Refer to Section 70-42-03 in the Standard Practices Manual.

1 Apply heat equally to all of the end plate. Use a gas torch with a reducing flame. Get to the necessary braze temperature as quickly as possible when the flux becomes liquid and stays liquid when the flame is removed.

2 Keep most of the heat on the areas which get the braze repair. When the part is at braze temperature, apply braze alloy to the recessed plug. Fill the tube end fully. Be careful not to get the tube ends too hot.

(h) After the assembly is cool, remove solid flux in a hot alkali solution. Make sure that all flux and remaining material are removed from the tube inner surfaces.

(i) Leak check

1 Install the packings on the core.

2 Use some procedure to keep the core in position in the housing during the check (do not install the end covers).

3 Pressurize the fuel side to 550 ± 10 psi for two minutes. The pressure must stay stable with no pressure change (plus or minus) permitted. No leaks are permitted.

NOTE: During the check the core and fluid temperatures must be ± 2.8°C (5°F).

(5) Fuel Heater Mounting Lug Sleeve Bushing Replacement
See Figure 1108.

NOTE: The limit for bushing replacement is three bushings for each heater assembly.

NOTE: The sleeve bushing and sleeve spacer are interchangeable in sets only.

(a) Replace the sleeve bushing if it is damaged, or if the bushing ID is worn more than 0.285 inch diameter.

(b) Find the position of the bushing pin and identify it with a mark.

(c) Machine out the damaged or worn bushing (be careful not to cause damage to the ID of the housing lug).

(d) Use the Drift from Tool Group A3 to install the new bushing as specified in the figure, Indexes 7 and 8. Apply antigalling compound to the bushing if necessary (see Note).

R NOTE: At the time of assembly, it is necessary to apply PWA 586 antigalling compound to PN 493221 bushing only. This compound is applied at manufacture (baked on) to bushing PN 633356.

(e) Install the Drill Fixture in the unfinished ID of the bushing. Move 0.100 inch or more away from the edge of the old pin hole to either side (to a heavier area of the housing) and drill a new hole which will be in the limits of Indexes 5, 6, 9, and 12 in the figure.

(f) Use the Drift to install a pin (10) in the bushing and mount lug.

(g) Install the fuel heater housing in the Reaming Fixture. Use the Reamer to machine the bushing ID to Index 2 limits (hold to a minimum dimension).

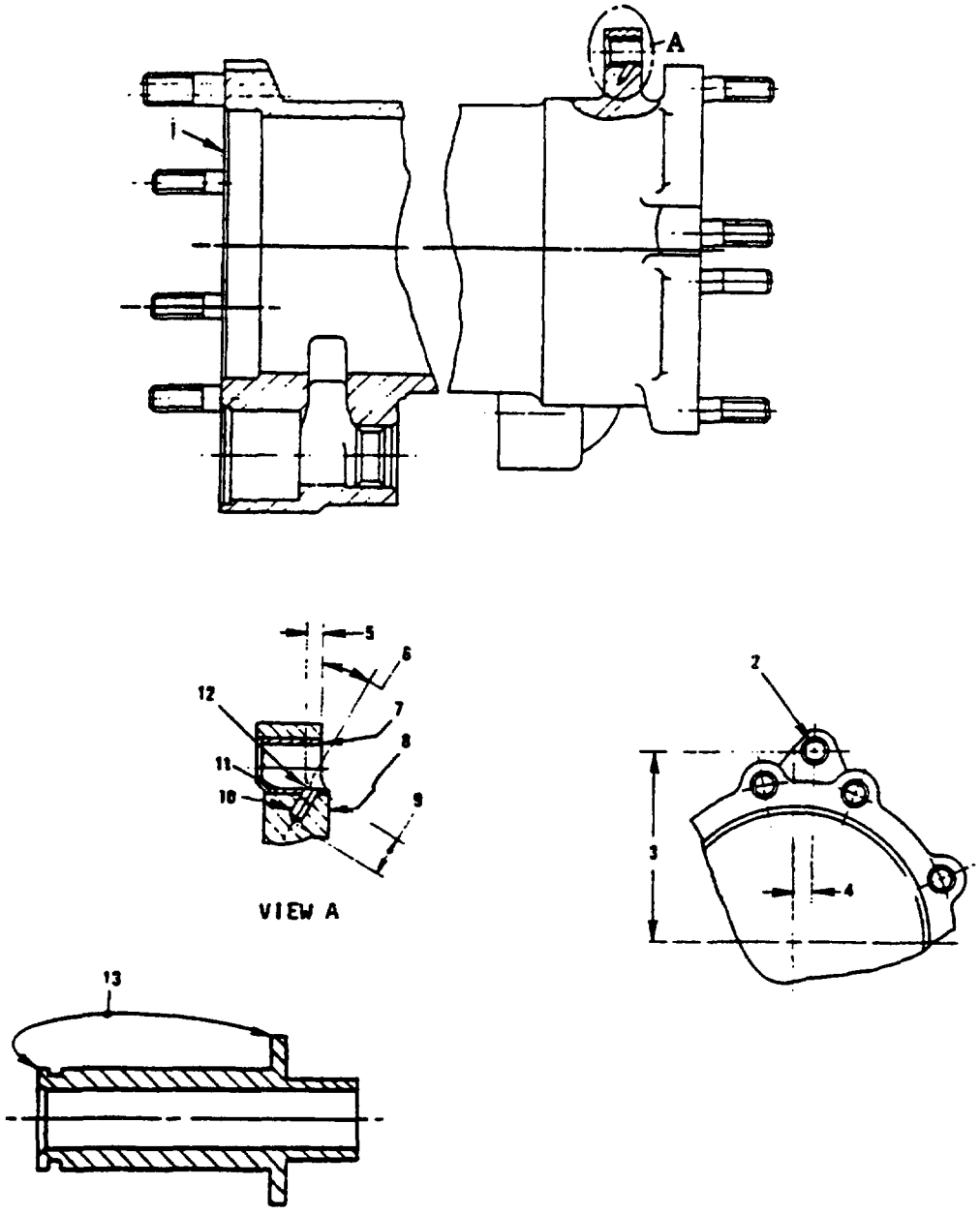
E. Assembly

R R R R NOTE: Install preformed packings with a thin layer of PWA 36500 lubricant or PWA 521 engine oil. Refer to Section 70-00-00, Assembly-03 in the Standard Practices Manual.

(1) Install a packing in the housing at the lip of the bearing opening. Push the bearing into the housing (be careful not to cut the packing). Attach the bearing with nuts and bolts. Tighten the bolts to the applicable torque.

(2) Install a packing in the groove in the large end of the heater core, and another in the groove on the inner surface of the housing.

(3) Install the smaller end of the heater core in the larger end of the housing (align the two parts carefully).



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R
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Fuel Deicing Heater
Housing Bushing Replacement
Figure 1108

EFFECTIVITY -ALL

1. Face A
2. 0.283 - 0.285 Inch Diameter Through, Located In 0.005 Inch Radius Of True Position, Square With Index 1 Face (Face A) 0.002 Inch FIR Maximum
3. 2.329 Inches
4. 0.257 Inch
5. 0.100 Inch
6. 30 Degrees
7. This Surface Must Be Flush To 0.020 Inch Below Surface 8.
8. Mount Lug Housing Surface
9. 0.220 - 0.260 Inch Depth
10. Pin (MS-9486-27)
11. Sleeve Bushing (PN 633355)
12. 0.0913 - 0.0933 Inch Diameter To Index 9 Depth, In 0.030 Inch Radius Of True Position
13. Sleeve Spacer (Apply Antigalling Compound To Applicable Parts (See Text).

Key To Figure 1108

CAUTION: INSTALL THE HEATER CORE CAREFULLY (DO NOT USE FORCE OR MOVEMENTS WHICH COULD CAUSE DAMAGE TO THE TUBES OR CONNECTIONS). MAKE SURE DURING INSTALLATION OF THE CORE THAT THE PACKINGS ARE NOT DAMAGED OR TWISTED.

(4) Use an arbor press to push the core into the housing until the core is fully installed.

(5) Install a packing in the groove in the front cover and install the cover in the small end of the housing. Attach the cover with washers and nuts, tightened to the applicable torque.

(6) Put a gasket in the groove on the rear cover and install the cover on the studs at the rear of the housing.

(7) Install spacer sleeves in the brackets.

NOTE: The sleeve with a flange flush with its end goes in the bracket with an elongated hole. The two sleeves are installed toward the front cover.

(8) Install the rod bracket on the two studs at the top rear of the housing with the larger end of the rod toward the front of the housing.

(9) Put nuts on all studs and tighten them to the recommended torque.

(10) After a test is satisfactorily completed on the heater assembly (refer to Testing), install the metering plate on the front cover. Make sure that the heads of the screws do not extend above the surface of the plate.

F. Testing

(1) General

(a) Equipment Necessary

1 Fuel pressure source that can supply 200 psig at no-flow conditions.

2 Air pressure source that can supply 225 psig at no-flow conditions.

3 Pressure gages that can measure fuel and air pressures from 0 to 225 psig ± 5 psi, that are accurate to ± 5 psi.

4 Test fixture

5 Temperature measuring equipment that can measure heater body temperature and heater fuel temperature, accurate to ± 1°C (°2F).

6 Test fluid, PMC 9041 or equivalent

(b) Test procedure

1 Air side leak check

a Look in areas inside the fuel heater air inlet and discharge covers for fuel and remove it if it is found.

b If the metering plate is installed, remove it and its gasket. Attach the detail covers to the fuel and air ports, then install the heater in the test fixture.

c Connect a pressure gage to the air side inlet fitting. The gage line must not be more than 3/8 inch ID, and not more than three feet long. Open the fuel side vent valve to ambient.

d Apply 225 psig ± 10 psi air pressure to the air side of the heater and close the valve in the heater air inlet fitting. Air leakage from the valve (when stable) must not be more than 100 psi in two minutes.

2 Fuel side leak check

a Connect the pressure gage to the fuel inlet port fitting. The line must not be more than 3/8 inch ID and must not be more than three feet long.

b With the fuel discharge bleed valve up and the air side vented to ambient, fill the fuel side of the heater with test fluid. Let the displaced air bleed through the fuel discharge bleed valve. After the air is bled out, close the valve.

c Apply 200 psig fuel pressure and hold it until the temperatures of the test fluid and the heater body are ± 3°C (5°F). Close the fuel inlet valve.

d The pressure when stable (with no pressure added) must not decrease more than 5 psi in two minutes.

e With the test fixture removed, there must be no fuel seen in the air inlet and discharge covers of the heater.

G. Preservation and Storage

(1) After test, prepare the heater assembly for storage:

a Install the metering plate and its gasket.

b If the storage period is estimated to be 21 days or less, it is sufficient to install caps on the two fuel ports and the two air ports.

c If the estimated storage period is more than 21 days, install caps on the fuel and air ports after the fuel side is flushed with Exxon Turbo Oil No. 10 or equivalent.

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4. Fuel Deicing Heater Bypass Valve

A. Disassembly

See Figure 1109.

(1) Push down the guide at the large end of the valve housing and remove the lockring.

(2) Remove the spring guide, spring, valve guide, and valve from the housing.

B. Cleaning

R (1) Flush all valve parts fully to clean them by SPOP 209.
R Refer to Section 70-21-00 in the Standard Practices
R Manual.

(2) Dry the parts by compressed air blast.

C. Inspection

(1) Examine all sealing surfaces for nicks or scratches.

(2) Examine all detail parts for dents, wear, or damage which it will not be possible to repair.

D. Assembly

(1) Put the valve guide on the valve shaft and shoulder and install it against the rear of the valve face.

NOTE: The widest part of the valve guide must be away from the valve face, toward the valve shaft.

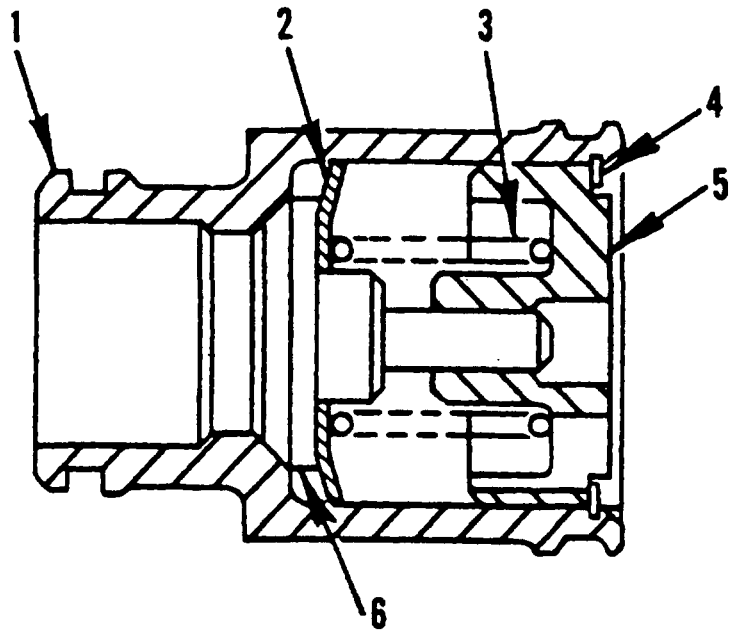
(2) Set the valve in the housing with the valve face against the valve seat.

(3) Put the spring in the housing, installed against the valve guide.

(4) Put the spring guide on the valve shaft with the spring installed in the deep groove in the guide.

(5) Push down on the spring guide and install the lockring in the groove in the valve housing.

R E. Table of Limits



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1. Housing
2. Guide
3. Spring
4. Retaining Ring
5. Guide
6. Valve

R
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Fuel Deicing Heater
Bypass Valve
Figure 1109

EFFECTIVITY -ALL

R (1) Refer to Figure 1110 for fits, clearances, and other limits applicable to the fuel deicing shutoff valve and actuator.

R (2) Refer to Section 72-00-00, Table of Limits for general notes related to reference numbers, units of measurement, and symbols used in Tables of Limits.

R REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
R (a)		Fuel Deicing Heater Bypass Valve Dimensional Limits					
R 596		Heater Bypass Valve	.182	.183			
R		Guide	.187	.188	.004	.006	.007
R (b)		Fuel Nozzle Internal Spring Load Limits					
R 871		Fuel Heater Bypass Valve Spring					
R		at 0.865 Inch			1.425	1.575	1.350
R		at 0.565 Inch			5.850	6.150	5.700

F. Testing

(1) General

(a) Equipment Necessary

1 Fuel pump that can supply 4000 pph of calibrating fluid at a discharge pressure of 55 psi to the upstream side of the bypass valve.

2 Holding fixture with upstream and downstream pressure taps

3 Flowmeter that can measure 500 - 4000 pph of test fluid, accurate to ± 1%

4 Pressure gage that can measure fuel pressures from 0 - 55 psig, accurate to ± 1 psi

5 Differential pressure gage that can measure differential fuel pressures from 0 to 20 psig, accurate to ± 0.2 psi

6 Test fluid (refer to the Table of Consumable Materials for the specifications of this fluid).

(2) Test procedure

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Fuel Heater Bypass Valve
Clearance Chart
Figure 1110

(a) Opening checks:

1 With the valve installed in the holding fixture, connect the differential pressure gage across the valve and install a pressure gage to measure the inlet pressure.

2 With the bench discharge valve closed, apply pressure to the upstream side of the bypass valve.

3 Get the upstream pressure stable at 50 psig ± 5 psig and slowly open the discharge valve to decrease the downstream pressure. Get to 500 pph from the low side and measure the pressure drop at that point (it must not be more than 17 psi). Then get to 4000 pph from the low side and measure the pressure drop at that point (it must not be more than 20 psi).

(b) Leak check

1 Set the inlet pressure at 50 ± 5 psig and put the valve though five fast cycles (quickly open and close the discharge valve). For the open position, use 2000 - 4000 pph.

2 After the cycles are completed, open the down-stream side of the valve and set the inlet pressure to get 8 psi differential pressure.

3 Measure leakage that is the result of this check (it must not be more than 25 cc/minute).

5. Fuel Deicing Shutoff Valve And Actuator

NOTE: Refer to Tool Group A4.

A. Disassembly

See Figure 1111.

(1) Separate the shutoff valve and actuator.

(a) Remove the three bolts that attach the flange of the shutoff valve assembly to the valve actuator assembly.

(b) Remove the valve actuator from the flange of the shutoff valve.

NOTE: Refer to Chapter/Section 75-00-00 for information related to overhaul of the actuator part of the valve and actuator assembly.

(2) Disassemble the shutoff valve.

(a) Remove the plug and gasket from the manifold and discard the gasket.

(b) Bend the tabs of the key washer straight and remove the washer.

(c) Use PWA 13139 Wrench (refer to Tool Group A4) to remove the nut.

(d) Attach the slotted flange of the valve housing to the base.

(e) Push out the valve shaft with a standard drift and remove the bearing from the shaft.

(f) Remove the housing from the base and turn it to let the valve fall out of the housing into the operator's hand.

(g) Remove the pin from the seal ring and remove the ring from the valve.

(h) Remove the thrust ring.

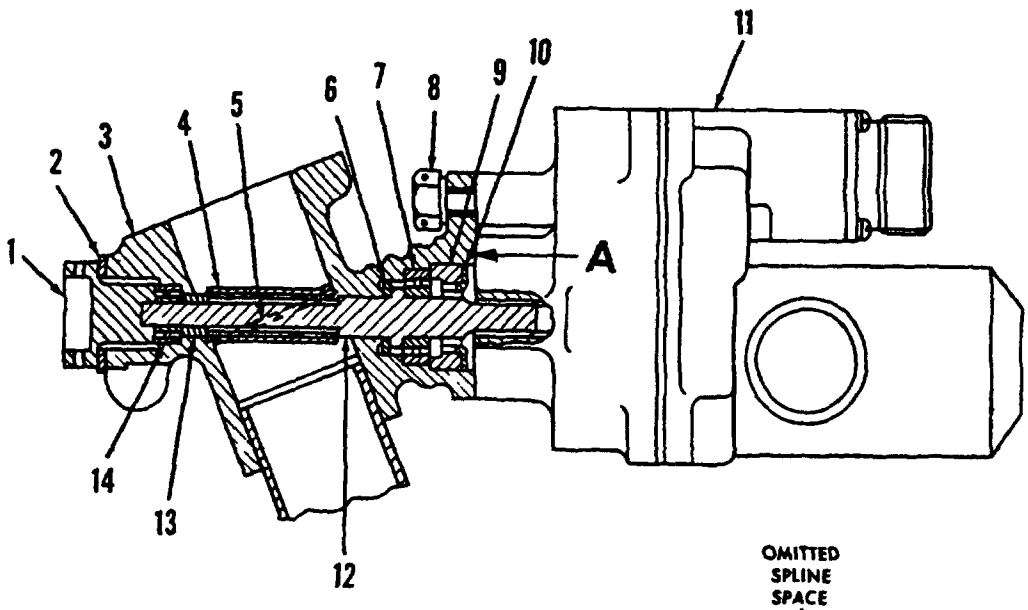
(i) Put the housing flange up and push the spacer and bearing out of the housing with a fiber drift.

(3) Disassemble the actuator gear housing assembly.

See Figure 1112.

NOTE: Do not disassemble the switch lever, seal plate, or gear housing further than specified in the figure. If these assemblies are damaged or worn, replace them.

(a) Remove the four screws and separate the gear housing assembly from the actuator assembly.



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1. Plug
2. Gasket
3. Valve Body
4. Valve
5. Seal Ring
6. Thrust Ring
7. Bearing
8. Bolt
9. Bearing Nut
10. Key Washer
11. Actuator
12. Shaft
13. Spacer
14. Bearing

Fuel Deicing Shutoff Valve
And Actuator
Figure 1111

(b) Pull the pin, spacer, and input gear from the gear housing. Lift the spring and pin from the gear housing.

(c) Move the actuator arm to the center position and remove the switch lever.

(d) Remove the seal plate to get access to the gear train.

(e) Remove in sequence the bearing pins, spur gears, and cluster gear. Remove the bearing pins, spur gears, and gear support. Remove the retaining ring from the support.

(f) Pull the actuator arm and the arm stop from the gear housing. Remove the seal from the actuator arm shaft.

(g) Pull the spacer and bearing from the housing.

B. Cleaning

CAUTION: DO NOT WASH THE ACTUATOR IN CLEANING SOLVENT (OR PUT IT FULLY INTO SOLVENT) (THIS CAN CAUSE DAMAGE TO ACTUATOR PARTS). KEEP THE ELECTRICAL PORTION FREE OF MOISTURE AND FOREIGN MATERIAL.

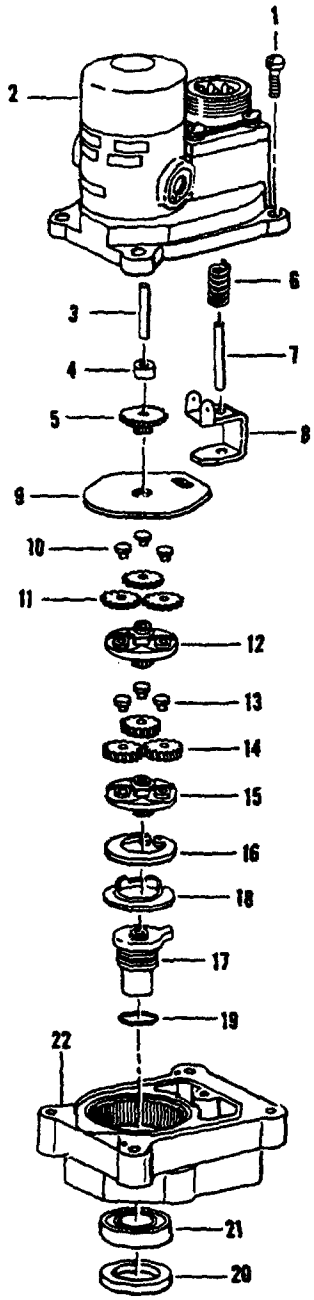
(1) Flush all valve and actuator parts fully by SPOP 209. Refer to Section 70-21-00 in the Standard Practices Manual.

(2) Dry all parts fully with compressed air or with a clean, lint-free cloth.

C. Inspection

See Table 1102.

(1) Examine all detail parts for nicks, dents, wear, frayed wiring, or thread damage. It is possible to polish out minor scratches or grooves with crocus cloth, followed by full cleaning to remove all remaining abrasive.



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Fuel Deicing Shutoff Valve
Actuator
Figure 1112 (Sheet 1)

1. Screw
2. Actuator Assembly
3. Pin
4. Spacer
5. Input Gear
6. Spring
7. Pin
8. Lever
9. Seal Plate
10. Pin
11. Spur Gear
12. Cluster Gear
13. Pin
14. Spur Gear
15. Gear Support
16. Retaining Ring
17. Arm
18. Arm Stop
19. Seal Ring
20. Flat Spacer
21. Ball Bearing
22. Housing

Key To Figure 1112 (Sheet 1)

(2) Refer to the table for gear tolerances, lubrication, spring working heights and load limits, bearing pin head thickness, and non-destructive fluorescent magnetic particle inspection (FMPI) requirements.

NOTE: Index number references in the table are to the key of Figure 1112 (Sheet 1).

INDEX NO	PART NAME	MEASURE ACROSS:	DIA (IN.)	DIMENSIONS (IN.) MIN	DIMENSIONS (IN.) MAX	NOTES/ REFERENCES
4	Spacer					Must be select fit as specified in text and Figure 1113.

FUEL

INDEX NO	PART NAME	MEASURE ACROSS:	DIA (IN.)	DIMENSIONS (IN.) MIN	MAX	NOTES/ REFERENCES
5	Input Gear	Teeth	0.027	0.7264	0.7244	Maximum diametral clearance of all gear mating surfaces must be 0.005 inch. If replaced, do a selection of the part by fit as specified in the text. Lubricate all gearteeth and bearing surfaces with a thin layer of Aero Lubriplate grease.
		Splines	0.030	0.2775	0.2755	
6	Spring					Working height 0.348 inch at 0.750 - 1.0 lb.
9	Seal Plate					Replace at each overhaul. Lubricate with a thin layer of Aero Lubriplate grease (do not get grease around electrical components).
10 13	Bearing Pins					Head thickness must be 0.015 - 0.017 inch.
11 14	Spur Gears	Teeth	0.027	0.6273	0.6253	Maximum diametral clearance of all gear mating surfaces must be 0.005 inch. Lubricate all gearteeth and bearing surfaces with a thin layer of Aero Lubriplate grease (do not get grease around electrical components). Too much grease on gears can cause critically slow

INDEX NO	PART NAME	MEASURE ACROSS:	DIA (IN.)	DIMENSIONS (IN.) MIN	MAX	NOTES/ REFERENCES
(CONTINUED)						
						operation at low temperatures.
12	Cluster Gear	Splines OD (3 each) Bearing Studs	0.1860	0.265	0.263	These parts get non-destructive inspection (FMPI). Lubricate all gearteeth and bearing surfaces with a thin layer of Aero Lubriplate grease (do not get grease around electrical components). Too much grease on gears can cause critically slow operation at low temperatures.
15	Gear Support	OD (3 each) Bearing Studs	0.1860			These parts get non-destructive inspection (FMPI). If gear support or retaining ring is replaced, ring must get a selective fit to give 0.160 - 0.170 inch space between the ring ears after assembly. Ring is available in 0.001 inch increments. Apply a thick layer of Lubriplate 930AA grease to the two sides of the retaining ring and to the gear support before and after installation.
16	Retaining Ring					

INDEX NO	PART NAME	MEASURE ACROSS:	DIA (IN.)	DIMENSIONS (IN.) MIN	DIMENSIONS (IN.) MAX	NOTES/ REFERENCES
19	Seal					Replace at each overhaul. Lubricate with a thin layer of Aero Lubriplate grease.
22	Gear Housing					This part gets nondestructive inspection (FMPI). If replaced, the idler gear must get a selective fit between the motor pinion and input gear. The idler gear is supplied in standard pitch diameter and in 0.003, 0.006, 0.008, and 0.010 inch increment undersize pitch diameters.

Fuel Deicing Heater Shutoff
Valve Actuator Inspection
Table 1102 (Continued)

D. Assembly

(1) Assemble the shutoff valve.

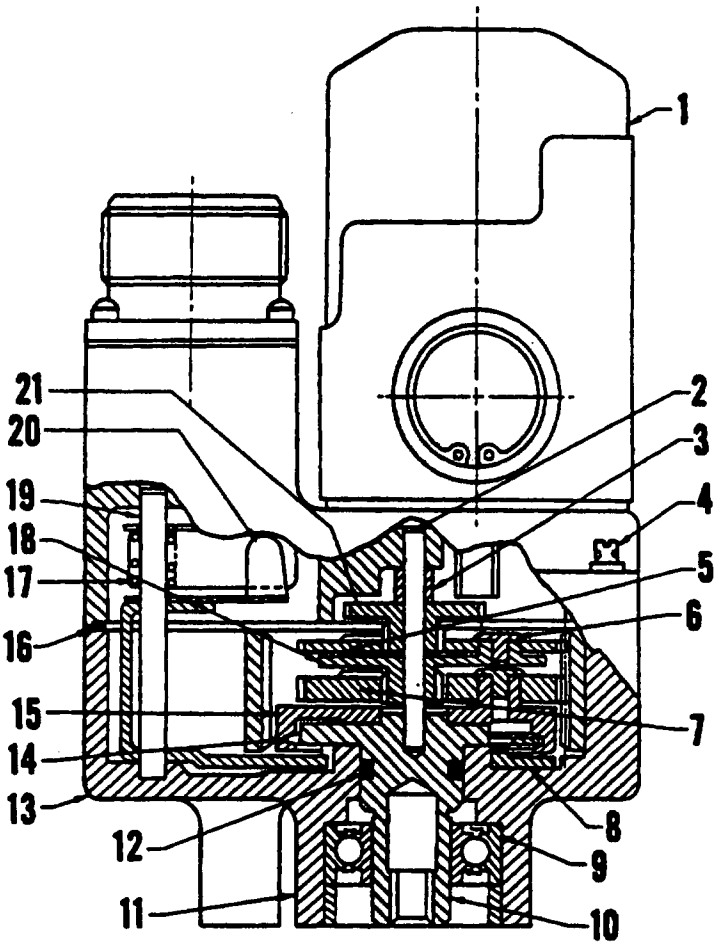
(a) Put the thrust ring in the opening of the flanged ring of the housing.

(b) Put the large bearing on the shaft and install it against the shaft shoulder.

(c) Install the seal ring in the valve and attach it with the pin.

(d) Put the valve in the valve housing in the closed position, with the omitted spline space as shown in Figure 1111.

(e) Install the shaft through the flanged opening in the housing and engage the splines correctly with the splines in the valve.



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Fuel Deicing Shutoff Valve
Actuator
Figure 1112 (Sheet 2)

1. Actuator Assembly
2. Pin
3. Spacer
4. Screw (4)
5. Spur Gear (3)
6. Pin (6)
7. Spur Gear (3)
8. Arm Stop
9. Bearing
10. Arm
11. Flat Spacer
12. Seal Ring
13. Housing
14. Retaining Ring
15. Gear Support
16. Seal Plate
17. Spring
18. Cluster Gear
19. Pin
20. Lever
21. Input Gear

Key To Figure 1112 (Sheet 2)

(f) Use the Drift from Tool Group A4 to install the shaft and bearing in the housing.

(g) Install the bearing nut in the housing and tighten it to the recommended torque with the Wrench from Tool Group A4.

(h) Install the key washer in the housing flange as shown in Figure 1111 and bend the two tabs into the nut to safety the nut.

(i) Attach the slotted flange of the valve housing to the Base from Tool Group A4.

(j) Put first the spacer, then the bearing on the end of the shaft in the small opening of the valve housing and install them with the Drift from Tool Group A4.

(k) Put a gasket on the plug and install the plug in the housing. Tighten the plug to the recommended torque and safety it with lockwire, then remove the housing from the base.

(2) Assemble the actuator gear housing assembly.

(a) Push the bearing and spacer into the gear housing.

(b) Install a new seal in the seal groove on the actuator arm. Put the arm stop in its seat in the gear housing. Put the actuator arm in the arm stop with the arm projection in the 70-degree space made by the raised portions of the arm stop.

(c) Install the retaining ring in the ring groove of the gear support.

(d) Put the retaining ring and gear support assembly on the arm stop (the ring ears must contain the arm projection and be in the 70-degree space made by the raised portion of the arm stop). Refer to Section 70-12-00, General-08 in the Standard Practices Manual for a source for Aero Lubriplate grease.

(e) Attach the spur gears in the gear support with pins.

(f) Put the cluster gear in position, in mesh with the spur gears and attach it with pins.

(g) Install the lever though the cutaway in the seal plate and install the seal plate on the gear housing. Put the foot of the switch lever in the cutaway portion of the arm stop circumference and between the bottom of the housing and the retaining ring.

(h) Install the pin through the holes in the lever and put the pin in its gear housing boss. Put the spring on to the pin.

(i) Put the input gear in position through the circular hole in the seal plate, in mesh with the spur gears.

(j) Install the pin through the input gear, cluster gear, and gear support and into the arm. Put the spacer down on to the pin.

(k) If the actuator housing input gear, cluster gears, arm stop, arm, seal plate, or gear housing were replaced, the spacer must get a select fit as follows: See Figure 1113.

1 Measure and record Dimension A (the distance from the actuator housing lower land surface to the bottom of the pin boss in the housing).

2 Measure and record the seal plate thickness, Dimension B.

3 With all parts installed in the gear housing, measure and record Dimension C (the distance from the gear housing upper land surface to the bottom of the depression in the center of the cluster gear).

4 Add Dimensions A, B, and C to get Dimension D and record this dimension.

5 Measure the thickness of the input gear, Dimension E. Add 0.012 inch to get Dimension F and record this dimension.

6 Subtract Dimension F from Dimension D. The difference is the spacer thickness which will be necessary. The spacer is available in a standard thickness and in more oversize and undersize thicknesses which increase or decrease in increments of 0.001 inch to get the correct fit.

(l) The actuator housing and gear housing must have an equal fit against the seal plate.

(m) The clearance between the seal plate and the upper bearing pins must be 0.005 - 0.040 inch to prevent blockage of the gear train against the seal plate. If there is not the necessary clearance, tap the internal components lightly into the housing to get the parts into their correct positions. If there is not the correct clearance, replace parts as necessary to lower the stack of parts.

(n) If the switch was replaced, make a preliminary adjustment. Bend the ears outward to prevent too much travel in the arm.

(o) Hold the actuator together by hand and do a test with operating voltage to make sure that the switch lever ears push the microswitches in the actuator housing to stop the motor at the end of 90° ± 3° travel of the actuator arm. To adjust the switch lever ears, bend them until operation is correct. Install the screws.

(p) Install the actuator and operate the motor until the arm stops at the full clockwise position. See Figure 1114. Find the A index mark at the key flat in the serration of the actuator arm and the other Index Mark B 180 degrees scribed on the side of the housing. The key flat of the actuator arm must be 45° ± 2° from the centerline C that bisects the straight line from the Index Mark A to the Index Mark B.

(q) Assemble the actuator assembly to the valve with bolts. Safety the bolts with lockwire.

(3) Attach the actuator to the shutoff valve.

(a) Put the valve in the closed position with the spline space in the position shown. See Figure 1111.

(b) Install the actuator, also in the closed position, on the valve assembly and attach it with three bolts.

(c) Make sure that the marks on the mounting flanges of the valve assembly and the actuator are aligned after the bolts are tightened.

E. Testing

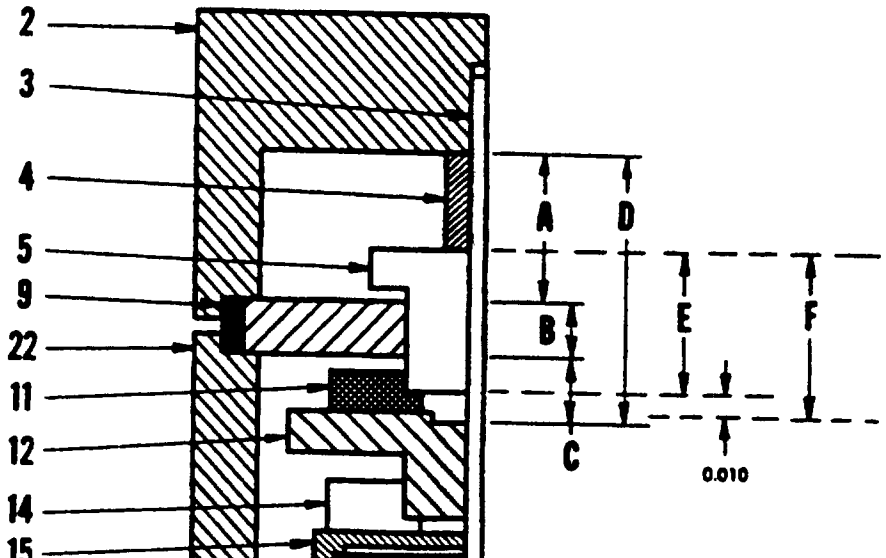
(1) General

(a) Regulated air supply (zero - 80 psig)

(b) Airflow measuring device accurate to three percent or less

(c) 24 volt DC/10 ampere electrical source

(d) 10 ampere scale DC ammeter



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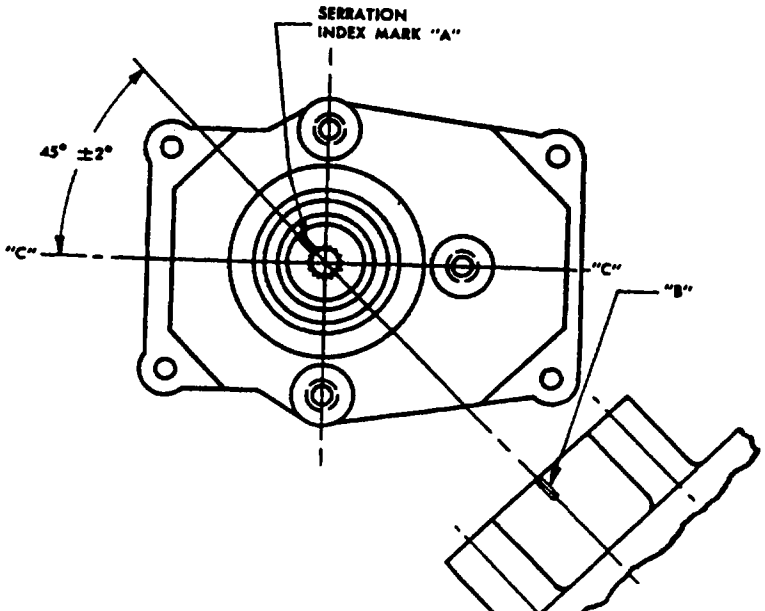
NOTE: Index numbers refer to the exploded view. See Figure 1112 (Sheet 1).

Fuel Deicing Shutoff Valve
Actuator Assembly Measurement
Figure 1113



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Fuel Deicing Shutoff Valve
Actuator Shaft Location
Figure 1114

(e) Cable connections, indicating lights, and single-pole, double-throw switch connected as shown. See Figure 1115.

(f) Stopwatch that can measure to 0.1 second

(2) Test procedure

(a) Motor actuator travel

See Figure 1115.

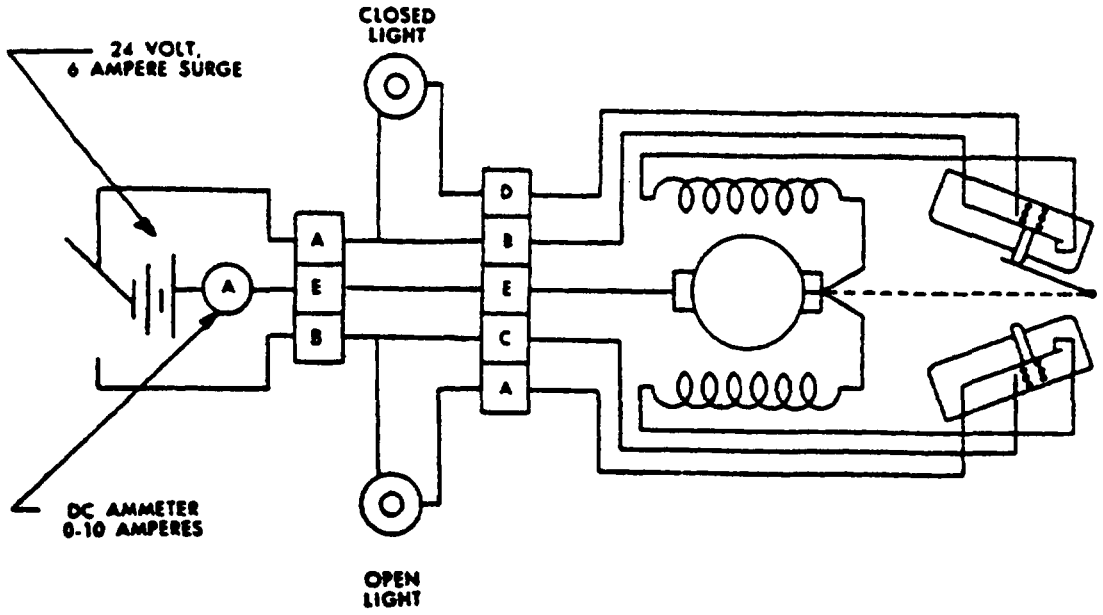
1 Remove the actuator from the valve and install the actuator on the Test Fixture from Tool Group A4. Install the indicator arm on the output shaft and put the indicator arm at approximately 90 degrees on the protractor scale.

NOTE: In the OFF position, the alignment mark on the output shaft will be at approximately 90 degrees.

2 Set the voltage at 24 volts with the rheostat. Set the selector switch to ON. The ON light will come on at the end of the counterclockwise movement of the shaft. Record the angle shown at the arm.

3 Set the selector switch to OFF. The OFF light will go off at the end of the clockwise movement of the shaft. Record the angle shown at the arm.

4 Set the minimum voltage, and set the selector switch to ON. Slowly increase the voltage until the shaft turns slowly counterclockwise and continues to turn until the ON light comes on. Record the angle at which the indicator arm stops. The difference between this angle and the angle measured in step 2 must be three degrees or more.



L-09053 (0000)

Fuel Deicing Shutoff Valve
Actuator Test Schematic
Figure 1115

5 Decrease the voltage to minimum and set the selector switch to OFF. Slowly increase the voltage until the shaft starts to turn slowly clockwise. The shaft will stop when the OFF light comes on. Record the angle at which the indicator arm stops. The difference between this angle and the angle measured in step 3 must be three degree or more.

6 Reject an actuator that does not operate in these limits.

7 Install the actuator on the valve.

(3) Leak check

(a) Connect the air supply line from the regulator to the upstream side of the valve. Connect the downstream side of the valve to the device to measure the leakage airflow.

(b) Operate the electrical circuit through one cycle to make sure that the actuator is in the closed position. Increase, then decrease the pressure slowly from 0 to 80 to 0 psig, then increase the pressure slowly to 10 and 50 psig and record the leakage airflow. Leakage flow at 10 psig must not be more than 1.5 cfm. Leakage at 50 psig must not be more than 3.5 cfm.

NOTE: Tap the valve near the butterfly (seal plate) to get the minimum leakage readings at these points.

(4) Operation check

(a) Connect the valve to the electrical circuit and set the voltage to 24 volts DC.

(b) Operate the valve through 10 half-cycles, with approximately 10 seconds between each cycle.

(c) Record the expired time between the open and close half-cycles. This time of operation must not be more than one second for a half-cycle.

(d) Measure the operating current drain. The operating current must not be more that two amperes (five amperes surge).

(e) Look to see if the open-position lamp comes on at the end of each valve-open half-cycle, and if the closed-position lamp comes on at the end of each valve-closed half-cycle.

(f) Reject a valve which is not in all of the above limits.

R F. Table of Limits

R (1) See Figure 1116 for fits, clearances, and other limits
R applicable to the fuel deicing shutoff valve and
R actuator.

R (2) Refer to Section 72-00-00, Table of Limits for general
R notes related to reference numbers, units of
R measurement, and symbols used in Tables of Limits.

REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
(a)		Fuel Deicing Shutoff Valve and Actuator Dimensional Limits					
528		De-Icing Shutoff Valve					
		Shaft Spline	.0201	.0216			
		Actuator Spline	.0221	.0231	.0005	.0030	.0035
534		De-Icing Shutoff Valve					
		Spline	.0221	.0231			
		Shaft Spline	.0201	.0216	.0005	.0030	.0035
585		Ball Bearing	.3746	.3750			
		Valve Housing	.3745	.3751	.0005T	.0005	.007
586		Ball Bearing	.1247	.1250			
		Valve Shaft	.1242	.1246	.0001	.0008	.0008
587		Flat Spacer	.264	.266			
		Valve Housing	.270	.274	.004	.010	.012
588		Thrust Ring	.5098	.5100			
		Valve Housing	.5100	.5105	.0000	.0007	.007
589		Anti-Icing Shutoff					
		Valve Shaft	.2494	.2500			
		Bearing	.2497	.2500	.0003T	.0006	.0006
589		Ball Bearing	.6246	.6250			
		Housing	.6250	.6255	.0000	.0009	.0011

R	REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
R	590		Ball Bearing	.2497	.2500			
R			Valve Shaft	.2494	.2500	.0003T	.0006	.0006
R	591		Flat Spacer	.125	.127			
R			Valve Shaft	.1242	.1246	.0004	.0028	.0040
R	592		Shutoff Valve					
R			Anti-Icing Shaft	.278	.280			
R			Housing	.284	.288	.004	.010	.014
R	593		Anti-Icing Shutoff					
R			Valve	.969	.973			
R			Housing	1.000	1.002	.027	.033	.036
R	594		Gap, Shutoff Valve					
R			Seal Ring And Seal					
R			Gap at 1.000 Inch Gage					
R			Diameter	.010	.020			
R			Shutoff Valve Housing	1.000	1.002	.010	.026	.026
R	595		Anti-Icing Shutoff					
R			Valve	.027	.031			
R			Seal Ring	.025	.026	.001	.006	.007
R	596		Heater Bypass Valve	.182	.183			
R			Guide	.187	.188	.004	.006	.007

R (b) Fuel Deicing Shutoff Valve and Actuator Assembly Torques

R	832		Anti-icing Air Valve Bearing Nut
R			Tighten nut to 10 lb-in, then tighten
R			to a subsequent locking position.

6. Fuel Manifolds

NOTE: Refer to Tool Group A5.

A. Disassembly

See Figure 1117.

(1) Hold the manifold, rear face up, on a holding fixture.

(2) Cut the air swirl guide nut lock at a wrench slot with diagonal cutters and remove it.

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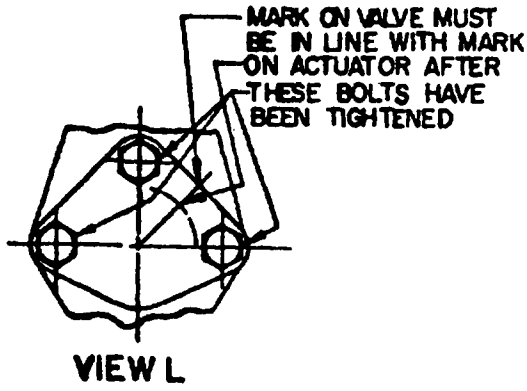

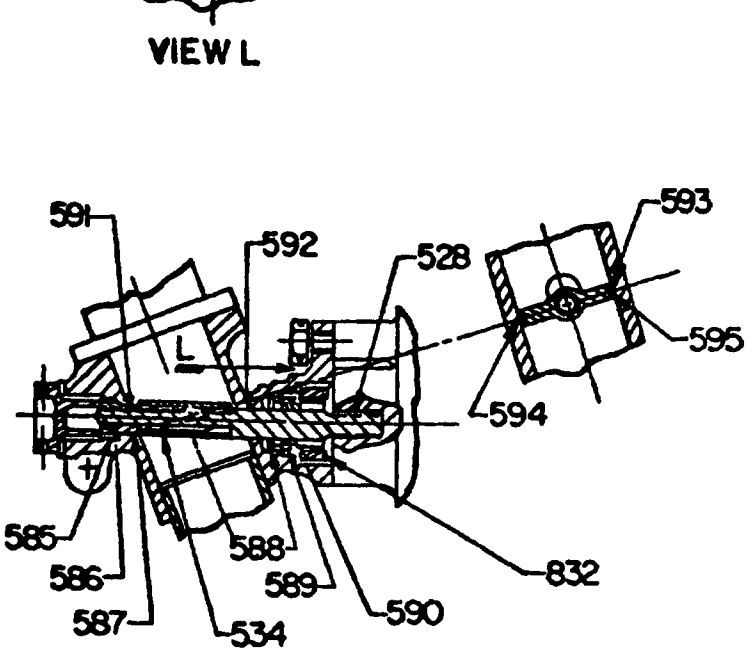

L-H8040 (0207)

ORIGINAL
As Received By
ATP

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Fuel Deicing Shutoff Valve
And Actuator Clearance Chart
Figure 1116

EFFECTIVITY -ALL

(3) Hold a torque support around two manifold nozzle bodies with clamps.

(4) Remove the fuel nozzle swirl guide with a wrench.

(5) Remove the fuel nozzle and discard the gasket.

B. Cleaning

R (1) Clean the manifold by one of these methods:

R (a) SPOP 203 (ultrasonic agitation method). Refer to
R Section 70-21-00 in the Standard Practices Manual.

R (b) SPOP 203 (ultrasonic agitation method with PS 344
R alkaline cleaner at 60° - 77°C (140° - 170°F).
R Refer to Section 70-21-00 in the Standard Practices
R Manual.

C. Inspection

(1) Examine the parts for dents, cracks in welds, damaged threads, and damaged sealing surfaces.

(2) Examine manifold mount lugs for wear. The minimum lug thickness is 0.150 inch. Maximum hole diameter is 0.600 inch.

D. Repair

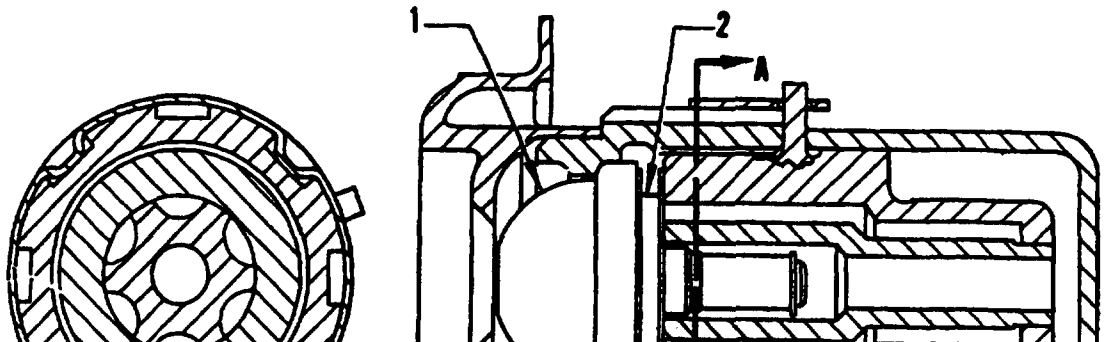
NOTE: This repair is applicable to PN 405866, 405867, 474844, and 474847.

(1) Fuel Manifold Lock Ring Retaining Tang Weld Repair. See Figure 1118.

(a) Examine the parts for dents, cracks in welds, damaged threads, and damaged sealing surfaces.

(b) Examine retaining tangs for damage and/or wear. Repair tangs if they have grooves that are worn more than 0.030 inch.

(c) Rout worn areas to remove surface contamination, to prepare for weld buildup.



L-09031 (0000)

1. Fuel Nozzle
2. Gasket
3. Air Swirl Guide Nut Lock
4. Air Swirl Guide

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Fuel Nozzle And Manifold Assembly
Figure 1117

CAUTION: WELD THE TANG WITH MINIMUM HEAT, TO KEEP HEAT AWAY FROM INTERNAL BRAZE JOINTS. CHILL BARS ARE RECOMMENDED TO PULL HEAT AWAY FROM BRAZE JOINTS. USE MULTIPLE PASSES TO APPLY WELD TO THE REPAIR AREA, WITH INTERVALS TO LET THE AREA COOL (NOT A SINGLE PASS).

(d) Weld the tang by the PWA 16-2 manual gas tungsten-arc welding method (GTAW-MA). Refer to Section 70-42-01 in the Standard Practices Manual. Use AMS 5680 filler metal sufficient to get the tang back to a serviceable condition. No stress-relief is necessary.

(e) Do a fluorescent penetrant inspection of the repaired area by SPOP 70 (normal sensitivity). Refer to Section 70-33-00 in the Standard Practices Manual. Do welds again as necessary.

(f) Finish machine the lock ring retaining ring tang as shown in the figure.

(g) Degrease by SPOP 209. Refer to Section 70-21-00 in the Standard Practices Manual.

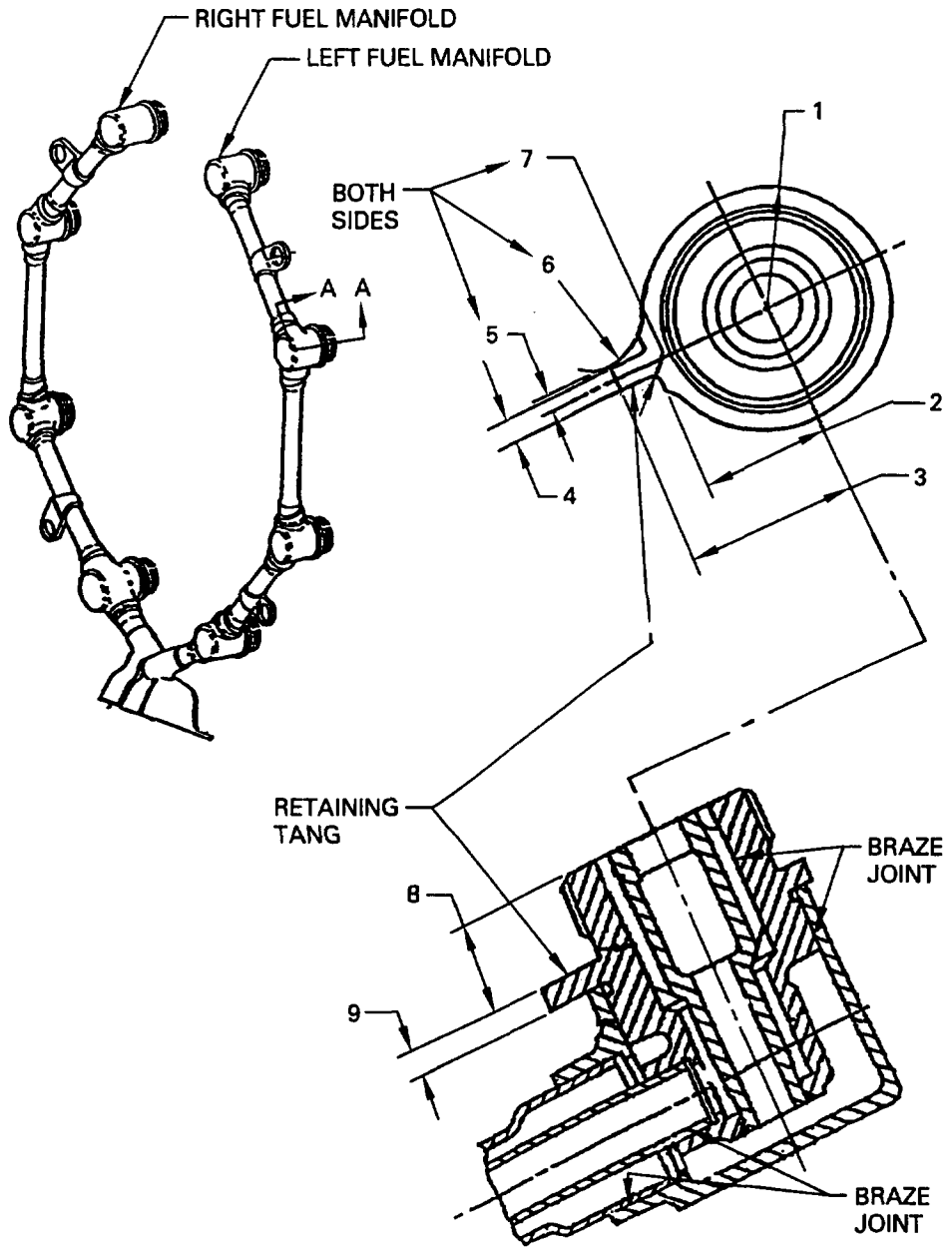
(2) Fuel Manifold Bracket Repair

R See Figure 1119 and Figure 1120.

CAUTION: BEFORE THIS REPAIR, BE SURE TO PROTECT ALL FUEL PASSAGES FROM DEBRIS AND CONTAMINATION.

(a) If the bracket mount flange is worn to a thickness of less than 0.210 inch but more than 0.200 inch, repair as follows:

1 To remove the wear washer from the manifold, either machine the washer off (do notdecrease the flange thickness to less than the 0.196 - 0.200 inch limit), or melt the braze and remove the washer.



Fuel Manifold Lock Ring
Retaining Tang Weld Repair
Figure 1118

1. 0.550 - 0.560 Inch Radius
2. 0.550 - 0.570 Inch
3. 0.720 - 0.740 Inch
4. 0.095 - 0.105 Inch, In True Position 0.010 Inch Maximum.
5. 0.060 - 0.090 Inch
6. 0.234 - 0.266 Inch Radius
7. 0.016 - 0.047 Inch Radius
8. 0.445 - 0.455 Inch
9. 0.095 - 0.105 Inch

Key To Figure 1118

CAUTION: THE TEMPERATURE IN THE BRAZE AREA (INDEX 8 IN THE FIGURE) MUST NOT BE MORE THAN 982°C (1800°F) DURING A BRAZE PROCEDURE.

2 Braze PN 483138 wear washer to the bracket rear face by AMS 2664. Refer to Section 70-42-03 in the Standard Practices Manual.

3 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

f Let the part decrease in temperature at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

4 Finish machine the washer, with the result that the bracket thickness added to the washer thickness is 0.219 - 0.221 inch.

NOTE: Keep the chamfer (Index 10 in the figure) in limits.

5 Finish machine the washer ID (Index 7).

NOTE: Make sure that the washer ID is in true position 0.005 inch radius maximum in relation to Index 2 diameter.

(b) If the bracket mount flange is worn to a thickness of less than 0.200 inch (through the wear washer in one or more locations) but more than 0.150 inch, repair as follows:

1 Remove the wear washer from the manifold bracket by one of these methods:

a Melt the braze and remove the washer.

b Machine the washer off (do not decrease the flange thickness to less than 0.150 - 0.200 inch).

NOTE: Keep Index 11 in the figure in limits.

2 Make sure that all braze material is removed from the mount bracket as follows:

a Put masks on the fuel tube (Index 17).

b Remove the braze material by dry abrasive blast, SPOP 218. Refer to Section 70-21-00 in the Standard Practices Manual.

CAUTION: IT IS RECOMMENDED TO USE CHILL BARS ON THE BRACKET TO PULL HEAT AWAY FROM THE INDEX 8 BRAZE AREA. USE MULTIPLE WELD PASSES TO APPLY WELD MATERIAL, WITH INTERVALS TO LET THE SURFACES BECOME COOL (NOT A SINGLE WELD PASS).

3 Apply weld material to the bracket bushing area by PWA 16-33, Process A. Refer to Section 70-42-01 in the Standard Practices Manual. Use AMS 5778 or AMS 5832 weld wire on the rear surface of the bracket mount flange. Keep weld buildup on the surface (see Index 18 in the figure) to the Index 19 dimension before the machining operation.

4 Machine the manifold bracket rear face to a bracket thickness of 0.196 - 0.200 inch. Keep Index 13 in the figure in limits where weld material flows into parent metal.

CAUTION: THE TEMPERATURE IN THE BRAZE AREA (INDEX 8 IN THE FIGURE) MUST NOT BE MORE THAN 982°C (1800°F) DURING THE BRAZE PROCEDURE.

5 Braze PN 483138 wear washer to the bracket rear face by AMS 2664. Refer to Section 70-42-03 in the Standard Practices Manual.

6 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

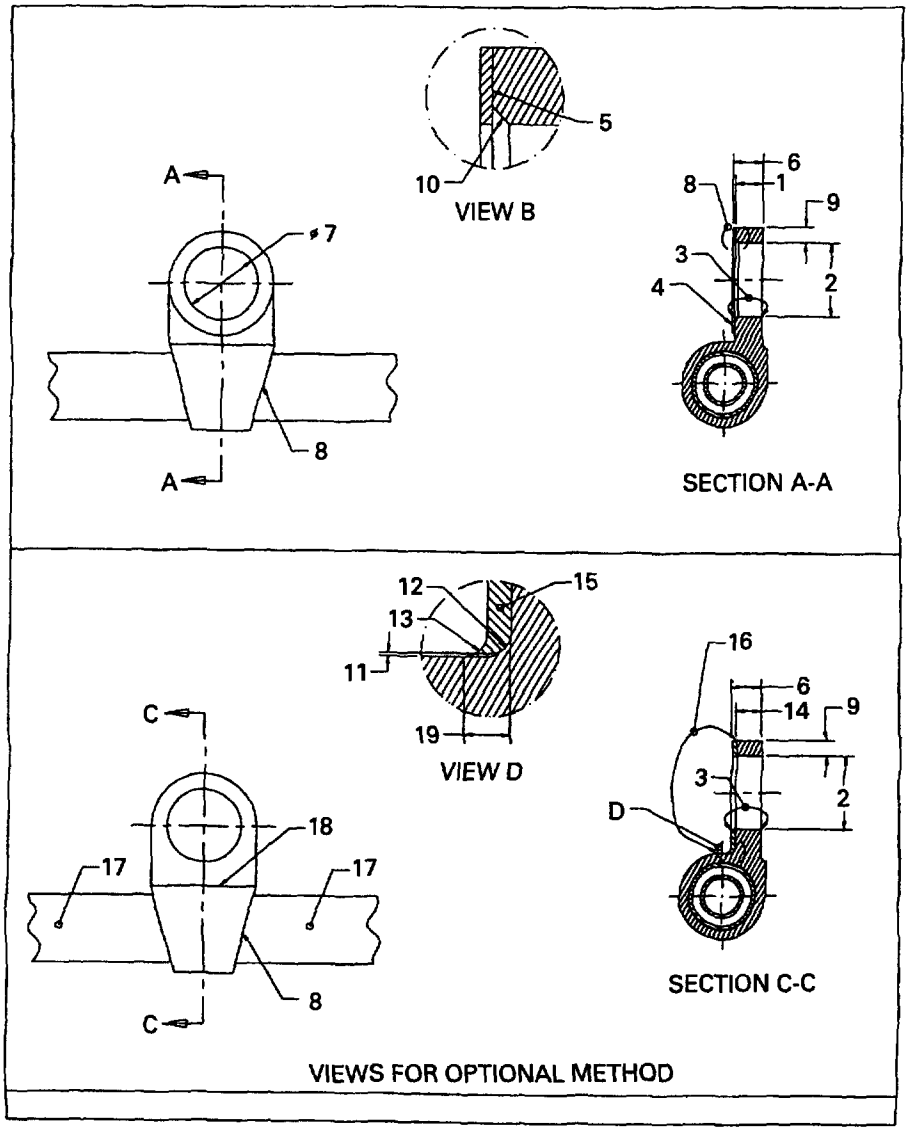
f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

7 Finish machine the washer, with the result that the bracket thickness added to the washer thickness is 0.219 - 0.221 inch.

NOTE: Keep the chamfer (Index 10 in the figure) in limits.

8 Finish machine the washer ID (Index 7).

NOTE: Make sure that the washer ID is in true position 0.005 inch radius maximum in relation to Index 2 diameter.



VIEWS FOR OPTIONAL METHOD

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Fuel Manifold Bracket
Washer Replacement Repair
Figure 1119

EFFECTIVITY -ALL

1. 0.196 - 0.200 Inch (Keep To These Limits During Damage Removal)
2. 0.525 - 0.535 Inch Diameter
3. Weld Area
4. Washer (See Text)
5. Braze Area
6. 0.219 - 0.221 Inch
7. Washer ID
8. Braze Area
9. 0.040 Inch Minimum
R 10. Chamfer 0.020 - 0.030 Inch By 43 - 47 Degrees
11. 0.000 - 0.020 Inch To Intersection
12. 0.031 Inch Radius Maximum
13. 0.031 Inch Radius Maximum
14. 0.150 Inch Minimum
15. Weld Buildup Area
16. Braze Removal Area
17. Mask Area
18. 0.020 Inch Maximum Wear Permitted On This Surface
19. 0.200 Inch Maximum

Key To Figure 1119

(c) Optional method: If the bracket mount flange is worn to a thickness of less than 0.210 inch but more than 0.150 inch, repair as follows:

R CAUTION: EXCEPT FOR WORK OR SUPPLIES TO BE PERFORMED OR FURNISHED BY PRATT & WHITNEY, PRATT & WHITNEY DOES NOT ENDORSE THE WORK PERFORMED BY THE COMPANY OR COMPANIES IDENTIFIED HEREIN OR ANY OTHER COMPANY OR COMPANIES FOR THE PERFORMANCE OF ANY WORK OR PROCUREMENT OF SUPPLIES.

R 1 This is a source demonstration repair. Send parts that are in repair limits to an approved source with a license for this repair. Refer to the source code list in Section 70-40-00, General-01 (Task 70-40-00-990-001) in the Standard Practices Manual for the company name, address, and contact information for companies identified by source code number.

R No approved source at this time.

R 2 Because this repair is critical, repair sources
R must show Pratt & Whitney that they can do this
R repair and must have a license from Pratt &
R Whitney. Write to the address in the
R Introduction section of this manual for
R information about the qualification program and
R how to become an approved and licensed source.

3 Remove the wear washer from the manifold bracket by one of these methods:

a Melt the braze and remove the washer.

b Machine the washer off (do not decrease the flange thickness to less than 0.150 - 0.200 inch). Keep the bracket thickness equal 0.010 inch across the surface.

NOTE: Keep Figure 1119, Index 11 in limits.

4 Make sure that all braze material is removed from the mount bracket as follows:

a Put masks on the fuel tube (Index 17).

b Remove the braze material by dry abrasive blast, SPOP 218 in area of Figure 1119, Index 16. Refer to Section 70-21-00 in the Standard Practices Manual.

CAUTION: IT IS RECOMMENDED TO USE CHILL BARS ON THE BRACKET TO PULL HEAT AWAY FROM THE INDEX 8 BRAZE AREA. USE MULTIPLE WELD PASSES TO APPLY WELD MATERIAL, WITH INTERVALS TO LET THE SURFACES BECOME COOL (NOT A SINGLE WELD PASS).

5 Apply weld material to the bracket bushing area by PWA 16-33 with AMS 5796 weld wire (cobalt base). Refer to Section 70-42-01 in the Standard Practices Manual. Keep weld buildup on the surface (see Index 18 in the figure) to the Index 19 dimension before the machining operation.

6 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

7 Finish machine the bracket, with the result that the bracket thickness added to the weld buildup thickness is 0.219 - 0.221 inch.

NOTE: PN 483138 wear washer is not used in this optional repair method.

8 Finish machine the washer ID (Index 7).

9 Do a fluorescent penetrant inspection of the repaired area by SPOP 62. Refer to Section 70-33-00 in the Standard Practices Manual.

(d) If the bracket mount flange was repaired before and the thicknesses (of flange and washer) are less than 0.219 inch but more than 0.200 inch, repair as follows:

1 Remove the wear washer from the manifold bracket by one of these methods:

a Melt the braze and remove the washer.

b Machine the washer off (do not decrease the flange thickness to less than 0.196 - 0.200 inch).

CAUTION: THE TEMPERATURE IN THE BRAZE AREA (INDEX 8 IN THE FIGURE) MUST NOT BE MORE THAN 982°C (1800°F) DURING THE BRAZE PROCEDURE.

2 Braze PN 483138 wear washer to the bracket rear face by AMS 2664. Refer to Section 70-42-03 in the Standard Practices Manual.

3 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

4 Finish machine the washer, with the result that the bracket thickness added to the washer thickness is 0.219 - 0.221 inch.

NOTE: Keep the chamfer (Index 10 in the figure) in limits.

5 Finish machine the washer ID (Index 7).

NOTE: Make sure that the washer ID is in true position 0.005 inch radius maximum in relation to Index 2 diameter.

(e) Optional method to step (d): If the bracket mount flange was repaired before and the added thicknesses are less than 0.219 inch but more than 0.200 inch, repair as follows:

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R CAUTION: EXCEPT FOR WORK OR SUPPLIES TO BE PERFORMED OR FURNISHED BY PRATT & WHITNEY, PRATT & WHITNEY DOES NOT ENDORSE THE WORK PERFORMED BY THE COMPANY OR COMPANIES IDENTIFIED HEREIN OR ANY OTHER COMPANY OR COMPANIES FOR THE PERFORMANCE OF ANY WORK OR PROCUREMENT OF SUPPLIES.

R 1 This is a source demonstration repair. Send parts that are in repair limits to an approved source with a license for this repair. Refer to the source code list in Section 70-40-00, General-01 (Task 70-40-00-990-001) in the Standard Practices Manual for the company name, address, and contact information for companies identified by source code number.

R No approved source at this time.

R 2 Because this repair is critical, repair sources must show Pratt & Whitney that they can do this repair and have a license from Pratt & Whitney. Write to the address in the Introduction section of this manual for information about the qualification program and how to become an approved and licensed source.

3 Remove the wear washer from the manifold bracket by one of these methods:

a Melt the braze and remove the washer.

b Machine to remove the washer and worn material (do not decrease the flange thickness to less than 0.150 - 0.200 inch). Keep the bracket thickness equal to 0.010 inch maximum across the surface.

NOTE: Keep Figure 1119, Index 11 in limits.

4 Make sure that all braze material is removed from the mount bracket as follows:

a Put masks on the fuel tube (Index 17).

b Remove the braze material by dry abrasive blast, SPOP 218 in area of Figure 1119, Index 16. Refer to Section 70-21-00 in the Standard Practices Manual.

CAUTION: IT IS RECOMMENDED TO USE CHILL BARS ON THE BRACKET TO PULL HEAT AWAY FROM THE INDEX 8 BRAZE AREA. USE MULTIPLE WELD PASSES TO APPLY WELD MATERIAL, WITH INTERVALS TO LET THE SURFACES BECOME COOL (NOT A SINGLE WELD PASS).

5 Apply weld material to the bracket bushing area by PWA 16-33 with AMS 5796 weld wire (cobalt base). Refer to Section 70-42-01 in the Standard Practices Manual. Keep weld buildup on the surface (see Index 18 in the figure) to the Index 19 dimension before the machining operation.

6 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

7 Finish machine the bracket, with the result that the bracket thickness added to the weld buildup thickness is 0.219 - 0.221 inch.

NOTE: PN 483138 wear washer is not used in this optional repair method.

8 Finish machine the washer ID (Index 7).

9 Do a fluorescent penetrant inspection of the repaired area by SPOP 62. Refer to Section 70-33-00 in the Standard Practices Manual.

(f) Optional method to step (e): If the bracket mount flange was repaired before and the added thicknesses are less than 0.200 inch but more than 0.150 inch, repair as follows:

1 Remove the wear washer from the manifold bracket by one of these methods:

a Melt the braze and remove the washer.

b Machine to remove the washer and worn material (do not decrease the flange thickness to less than 0.150 - 0.200 inch). Keep the bracket thickness equal to 0.010 inch maximum across the surface.

NOTE: Keep Figure 1119, Index 11 in limits.

2 Make sure that all braze material is removed from the mount bracket as follows:

a Put masks on the fuel tube (Index 17).

b Remove the braze material by dry abrasive blast, SPOP 218 in area of Figure 1119, Index 16. Refer to Section 70-21-00 in the Standard Practices Manual.

CAUTION: IT IS RECOMMENDED TO USE CHILL BARS ON THE BRACKET TO PULL HEAT AWAY FROM THE INDEX 8 BRAZE AREA. USE MULTIPLE WELD PASSES TO APPLY WELD MATERIAL, WITH INTERVALS TO LET THE SURFACES BECOME COOL (NOT A SINGLE WELD PASS).

3 Apply weld material to the bracket bushing area by PWA 16-33, Process A. Refer to Section 70-42-01 in the Standard Practices Manual. Use AMS 5778 or AMS 5832 weld wire on the rear surface of the bracket mount flange. Keep weld buildup on the surface (see Index 18 in the figure) to the Index 19 dimension before the machining operation.

4 Machine the manifold bracket rear face to a bracket thickness of 0.196 - 0.200 inch. Keep Index 13 in the figure in limits where weld material flows into parent metal.

CAUTION: THE TEMPERATURE IN THE BRAZE AREA (INDEX 8 IN THE FIGURE) MUST NOT BE MORE THAN 982°C (1800°F) DURING THE BRAZE PROCEDURE.

5 Braze PN 483138 wear washer to the bracket rear face by AMS 2664. Refer to Section 70-42-03 in the Standard Practices Manual.

6 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

7 Finish machine the washer, with the result that the bracket thickness added to the washer thickness is 0.219 - 0.221 inch.

NOTE: Keep the chamfer (Index 10 in the figure) in limits.

8 Finish machine the washer ID (Index 7).

NOTE: Make sure that the washer ID is in true position 0.005 inch radius maximum in relation to Index 2 diameter.

(g) Optional method to step (f): If the bracket mount flange is worn to a thickness less than 0.200 inch but more than 0.150 inch, repair as follows:

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R

R CAUTION: EXCEPT FOR WORK OR SUPPLIES TO BE PERFORMED OR FURNISHED BY PRATT & WHITNEY, PRATT & WHITNEY DOES NOT ENDORSE THE WORK PERFORMED BY THE COMPANY OR COMPANIES IDENTIFIED HEREIN OR ANY OTHER COMPANY OR COMPANIES FOR THE PERFORMANCE OF ANY WORK OR PROCUREMENT OF SUPPLIES.

R 1 This is a source demonstration repair. Send parts that are in repair limits to an approved source with a license for this repair. Refer to the source code list in Section 70-40-00, General-01 (Task 70-40-00-990-001) in the Standard Practices Manual for the company name, address, and contact information for companies identified by source code number.

R No approved source at this time.

R 2 Because this repair is critical, repair sources must show Pratt & Whitney that they can do this repair and must have a license from Pratt & Whitney. Write to the address in the Introduction section of this manual for information about the qualification program and how to become an approved and licensed source.

3 Remove the wear washer from the manifold bracket by one of these methods:

a Melt the braze and remove the washer.

b Machine to remove the washer and worn material (do not decrease the flange thickness to less than 0.150 - 0.200 inch). Keep the bracket thickness equal to 0.010 inch maximum across the surface.

NOTE: Keep Figure 1119, Index 11 in limits.

4 Make sure that all braze material is removed from the mount bracket as follows:

a Put masks on the fuel tube (Index 17).

b Remove the braze material by dry abrasive blast, SPOP 218 in area of Figure 1119, Index 16. Refer to Section 70-21-00 in the Standard Practices Manual.

CAUTION: IT IS RECOMMENDED TO USE CHILL BARS ON THE BRACKET TO PULL HEAT AWAY FROM THE INDEX 8 BRAZE AREA. USE MULTIPLE WELD PASSES TO APPLY WELD MATERIAL, WITH INTERVALS TO LET THE SURFACES BECOME COOL (NOT A SINGLE WELD PASS).

5 Apply weld material to the bracket bushing area by PWA 16-33 with AMS 5796 weld wire (cobalt base). Refer to Section 70-42-01 in the Standard Practices Manual. Keep weld buildup on the surface (see Index 18 in the figure) to the Index 19 dimension before the machining operation.

6 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

7 Finish machine the bracket, with the result that the bracket thickness added to the weld buildup thickness is 0.219 - 0.221 inch.

NOTE: PN 483138 wear washer is not used in this optional repair method.

8 Finish machine the washer ID (Index 7).

9 Do a fluorescent penetrant inspection of the repaired area by SPOP 62. Refer to Section 70-33-00 in the Standard Practices Manual.

(h) If the bracket mount lug ID is worn more than 0.535 inch diameter, repair as follows:

NOTE: The outer wall of the bracket (Figure 1119, Index 9) must be a minimum of 0.040 inch thick to do this repair.

1 Apply weld material to the bracket bushing area by fusion weld. Refer to Section 70-42-01 in the Standard Practices Manual. Use AMS 5778, AMS 5832, or AMS 5796 weld wire.

2 Stress-relieve as follows:

a Heat the oven to 260°C (500°F) maximum and put the part in the oven.

b Increase the temperature to 316°C (600°F) and hold for 30 minutes.

c Increase the temperature to 427°C (800°F) and hold for 30 minutes.

d Increase the temperature to 566°C (1050°F) and hold for 30 minutes.

e Increase the temperature to 691° - 728°C (1275° - 1325°F) and hold for two hours.

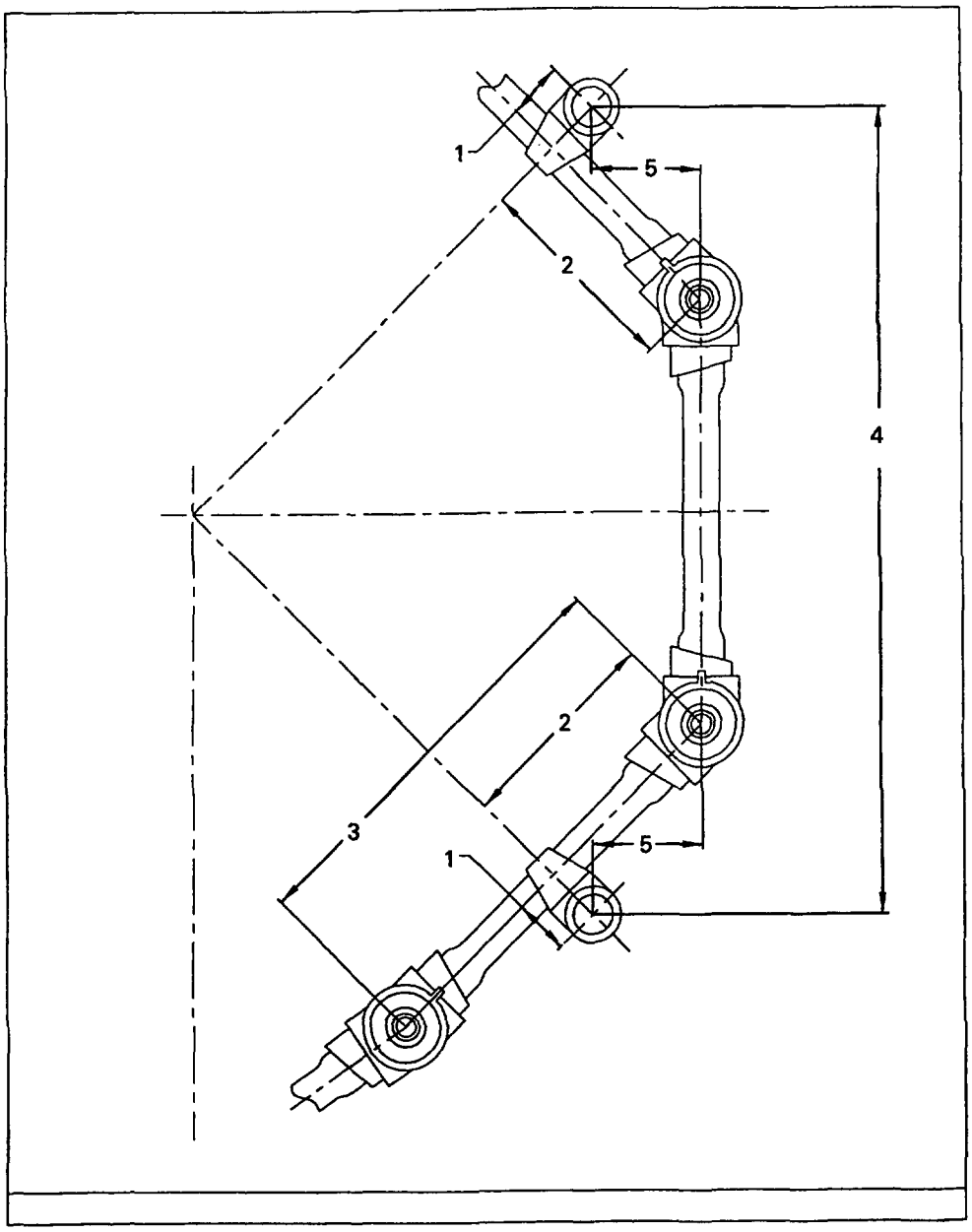
f Let the temperature of the part decrease at a rate not more than 38°C (100°F) in 15 minutes down to 260°C (500°F).

3 Finish machine the bracket ID to 0.525 - 0.535 inch diameter. Keep the holes 0.010 inch either side of true position. See Figure 1120, Indexes 1 thru 5.

NOTE: Keep the chamfer (Figure 1119, Index 10) in limits.

E. Assembly

(1) Install the manifold, rear face up, on the Holding Fixture.



L-H3183 (1296)

Fuel Manifold Bracket Repair
Figure 1120

1. 0.752 Inch
2. 2.817 Inches
3. 5.633 Inches
4. 10.680 Inches
5. 1.460 Inches

Key To Figure 1120

CAUTION: USE A LUBRICANT MIXTURE SUFFICIENTLY THICK TO PREVENT LEAKAGE ONTO THE FUEL NOZZLE SCREENS, AND APPLY THE MIXTURE IN SMALL QUANTITIES.

(2) Apply a mixture of molybdenum disulfide powder and oil (refer to AMS 3065) to the nozzle body threads with a small brush.

(3) Install the nut lock, smooth edge up, on the nozzle body (the stud on the side of the body must engage the hole in the lock).

(4) Put the gasket on the fuel nozzle and install the nozzle in the fuel nozzle body (be sure to use only fuel nozzles for which overhaul procedures and calibration were done).

NOTE: Make sure that the nozzles are installed in sets only.

(5) Turn the fuel nozzle air swirl guide on to the nozzle body, inside the lock.

CAUTION: TIGHTEN THE SWIRL GUIDE CAREFULLY. IF THIS CAUSES DISTORTION OF THE MANIFOLD, IT WILL BE NECESSARY TO REJECT THE PART.

(6) Use a clamp to install Torquing Support around the two manifold nozzle bodies. Tighten the air swirl guide to the recommended torque with a Wrench.

(7) After calibration, safety the nut lock in three or four places with a crimper.

F. Testing

(1) Purpose

(a) The purpose of testing the manifolds is to make sure that there is no leakage:

1 Between the primary and secondary passages

or

2 From the primary and/or secondary passages to the atmosphere.

NOTE: The primary passages are the large diameter (outer) tubes. The secondary passages are the small diameter (inner) tubes.

(b) General

R 1 Use fuel system component test fluid (PMC 9041) during this test.

2 The fuel temperature at the manifold entrance must be 25° - 28°C (77° - 83°F).

3 Pressure gages must be accurate to ± 0.5 psi.

4 The manifold must be on the Holding Fixture during all operations.

5 The fuel bench must have a 10-micron filter upstream from the fuel nozzle manifold assembly.

(c) Preparation

See Figure 1121.

1 Install the fuel manifold and Holding Fixture level on the test stand with the nozzles up.

2 Install Sealing Clamps on all nozzles.

3 Assemble the Burette and Valve assembly with the mid-point of the burette scale on a level with the manifold. Attach the quick-disconnect connections to the primary and secondary connectors on the Test Adapter which is installed on the manifold inlet pad. Connect the test stand outlet to the Burette Valve inlet.

CAUTION: AFTER THE SYSTEM IS BLED, THE FLUID LEVEL IN THE BURETTE MUST BE LEVEL WITH THE HIGHEST POINT OF THE FUEL MANIFOLD.

4 Open valves No. 1, 2, and 3 and start the flow of test fluid at low pressure. Bleed air out of the primary and secondary lines (loosen, then tighten the sealing clamp on each nozzle).

5 If nozzles were removed from the manifold before its installation in an engine, do the test procedure again.

(d) Test procedure

1 Primary-to-secondary leakage check

a Stop the flow at valve No. 2 and increase the feed pressure to 600 ± 10 psi. Keep this pressure on the primary for a stable period of two minutes, then monitor the Burette for five minutes. If there is leakage from the primary to the secondary, there will be a constant increase in the fluid level in the tube for the full test period. If there is more than 3 cc of leakage in a five-minute period, reject the manifold.

b If there is too much leakage, look to see if the Clamps are in good condition and correctly installed and tightened. If the leakage continues, replace the fuel nozzle gaskets and examine the sealing surfaces of the nozzles and manifold. Replace parts as necessary to bring leakage into limits.

2 External leakage check

a Close valve No. 1 and open valve No. 2. This will put 600 ± 10 psi in the primary and secondary manifolds.

b Monitor the external surfaces of the manifold and nozzle bodies for leakage of the secondary passage fluid to the atmosphere.

c Leakage to the atmosphere during a five-minute period is cause to reject the manifold.

7. Fuel Nozzles

NOTE: Refer to Tool Group A6.

A. Disassembly

See Figure 1122 and Figure 1123.

(1) Hold the nozzle in the Fuel Nozzle Holder.

(2) Remove the primary strainer retaining ring (push on its open end with the flat side of a small screwdriver).

(3) Remove the primary strainer element.

(4) Remove the primary strainer.

(5) Remove the primary strainer sleeve.

(6) Remove the primary strainer body:

(a) Push the end of the strainer body down toward the nozzle body.

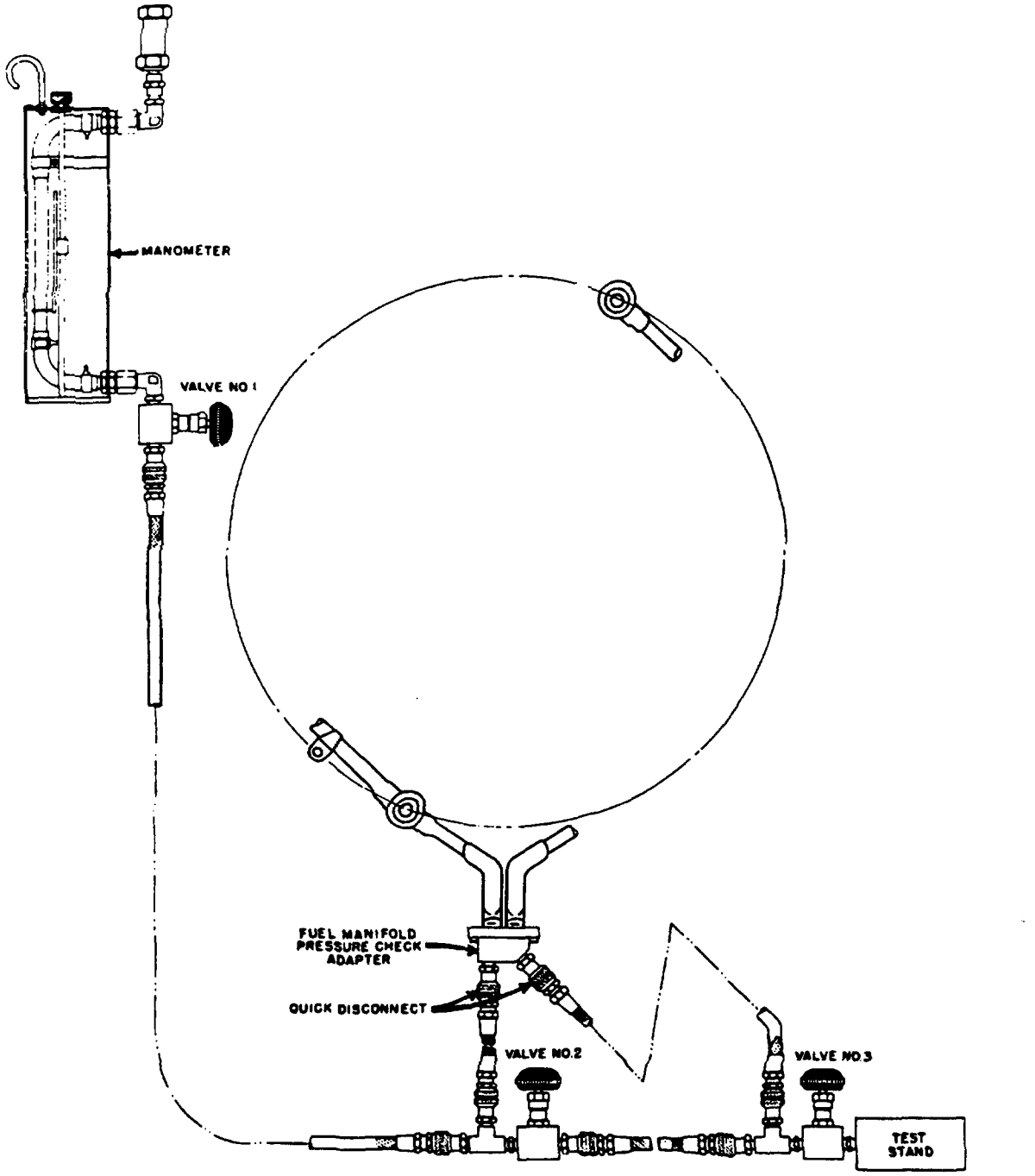
(b) Hold it down and remove the retaining ring from its groove in the main insert (start with the end of the ring which is bent inward).

NOTE: For this operation, a small hand tool will be necessary: Make a tool from 1/16 inch tool steel, with a taper down to a point, bent for 1/64 inch to make a very small hook. Install the other end of the rod into a 5/16 inch by 2 inch wooden dowel for a handle.

CAUTION: DO NOT LET PARTS FALL ON THE WORK SURFACE (THIS CAN CAUSE DAMAGE).

(7) Remove the primary metering plug retaining spring and the primary metering plug.

(8) Remove the main insert retaining ring with Truarc No. 1 pliers.



L-08974 (0000)

Fuel Manifold Leak Check
Figure 1121

CAUTION: DO NOT CAUSE SCRATCHES OR DAMAGE TO THE SEALING FACE OF THE NOZZLE BODY OR MAIN INSERT. ALSO BE VERY CAREFUL TO PREVENT DAMAGE TO THE END POINT ON THE MAIN INSERT.

(9) Remove the main insert.

(10) Remove the secondary metering ring.

NOTE: The primary metering plug, nozzle body, main insert, and secondary metering rings are details of a matched set, and it is necessary to keep them together.

B. Cleaning

R (1) Put all disassembled nozzle parts (but not strainers and retaining rings) in a stainless steel wire mesh basket (keep individual parts from each nozzle assembly together as a set) and give sufficient protection for parts (do not let them touch each other or other nozzle parts during the cleaning operation).

R (2) Chemically clean carbon from nozzle assemblies with one of these methods:

R CAUTION: BE CAREFUL WITH PARTS TO PREVENT MECHANICAL DAMAGE OR SCRATCHES ON CRITICAL SURFACES WHICH COULD OCCUR IF THEY TOUCH.

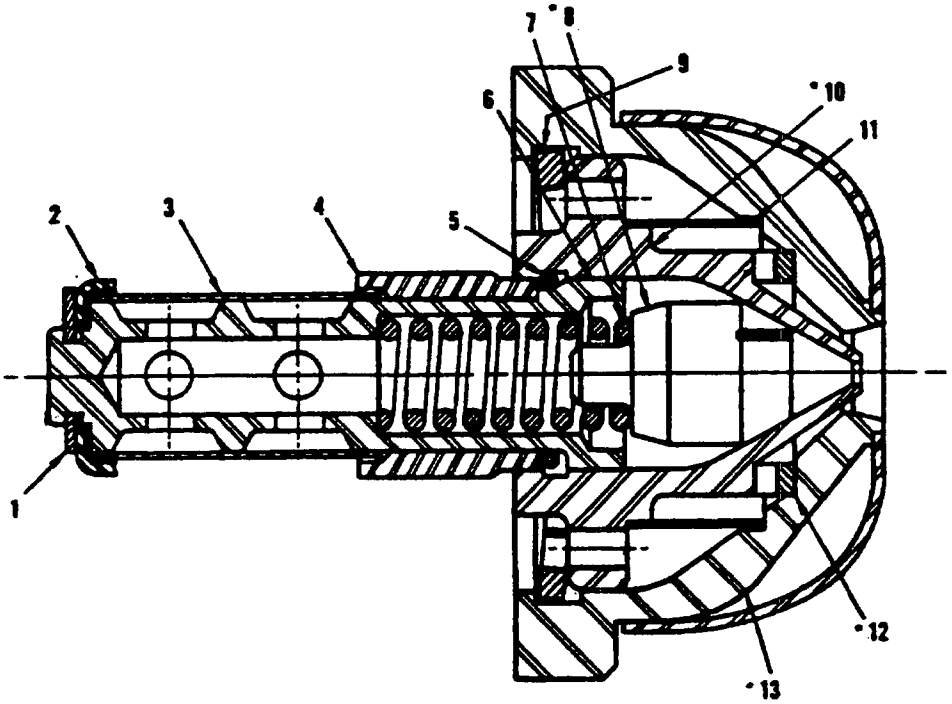
R (a) Clean by SPOP 203 (ultrasonic agitation method). Refer to Section 70-21-00 in the Standard Practices Manual.

R (b) Use SPOP 203 (ultrasonic agitation method with PS 344 alkaline cleaner at 60° - 77°C (140° - 170°F). Refer to Section 70-21-00 in the Standard Practices Manual.

R (3) Immerse in cold water, followed by a spray rinse of internal passages.

R (4) Immerse or spray rinse for two to three minutes in water at 66° - 93°C (150° - 200°F).

R (5) Dry with clean compressed air at 30 psig maximum discharge pressure.



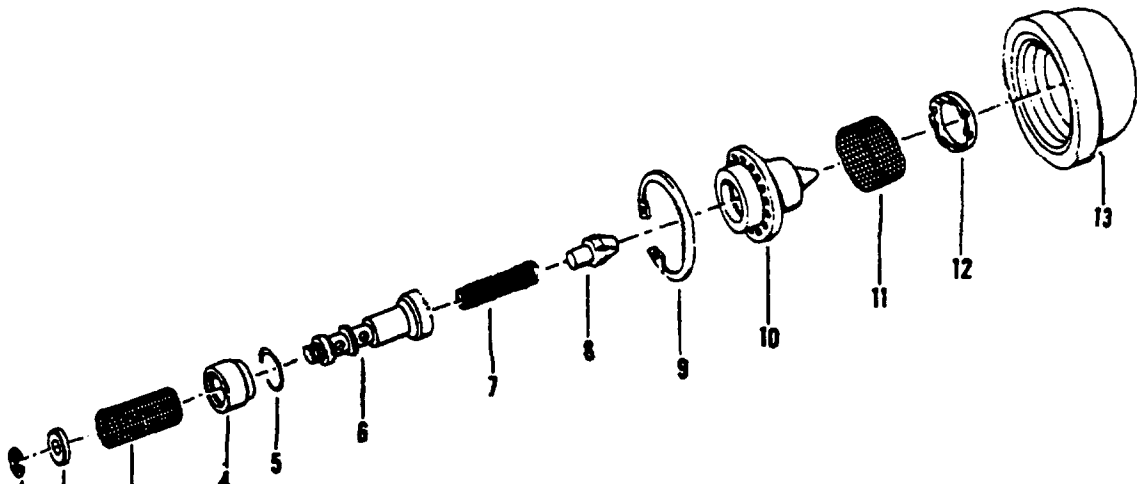
L-08652 (0000)

1. Retaining Ring
2. Primary Strainer Seat
3. Primary Strainer
4. Spacer Sleeve
5. Retaining Ring
6. Primary Strainer Body
7. Spring
8. Primary Metering Plug*
9. Retaining Ring
10. Main Insert*
11. Secondary Strainer
12. Secondary Metering Ring*
13. Nozzle Body*

*Fuel metering set

R
R

Fuel Nozzle Cross Section
Figure 1122



L-09037 (0000)

1. Retaining Ring
2. Primary Strainer Seat
3. Primary Strainer
4. Spacer Sleeve
5. Retaining Ring
6. Primary Strainer Body
7. Spring
8. Primary Metering Plug*
9. Retaining Ring
10. Main Insert*
11. Secondary Strainer
12. Secondary Metering Ring*
13. Nozzle Body*

*Fuel metering set

R
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Fuel Nozzle Exploded View
Figure 1123

R (6) Immerse or spray rinse for five minutes in water at
R 66° - 93°C (150° - 200°F).

(7) Dry with clean compressed air at 30 psig maximum discharge pressure.

(8) Remove all remaining carbon with a brush with stiff, non-metallic bristles.

(9) Examine the parts to be sure that they are clean, and clean again if necessary.

CAUTION: BE SURE TO DO THE MECHANICAL CLEANING OPERATIONS WITHIN TWO HOURS AFTER CHEMICAL CLEANING (THIS PREVENTS THE HARDENING OF THE REMAINING CARBON DEPOSITS).

(10) After the parts are cleaned by the above procedures, do the cleaning operations that follow when necessary to remove all carbon and discoloration and to give a clean, bright surface:

CAUTION: DO THE POLISHING OPERATIONS ON THE NOZZLE BODY AND MAIN INSERT ONLY WHEN NECESSARY TO REMOVE ALL FOREIGN MATERIAL AND GIVE A CLEAN, BRIGHT SURFACE. DO NOT REMOVE METAL FROM PARTS, BECAUSE TOO MUCH POLISHING CAN INCREASE THE NOZZLE FLOW AND CHANGE SPRAY CHARACTERISTICS.

(a) Turn the nozzle body in a lathe or polishing spindle and polish the orifice diameter and the outer orifice angle with a round toothpick and
R GK-5 (600 grit) garnet lapping compound (refer to
R Section 70-12-00 General-08 in the Standard Practices Manual). Use a 1/4-inch round wooden dowel with a blunt point and contours that are correct for the nozzle parts with the polishing compound to polish the area adjacent to the orifice on the inside of the body.

(b) Turn the main insert in a spindle and polish the pilot orifice with the same procedure as above. Also polish the area adjacent to the orifice on the inside of the main insert as specified above, but use a 1/8-inch round wooden dowel.

(c) Clean the metering slots of the secondary metering ring with the corner of a piece of brass shim stock 0.015 inch thick. Clean the metering slots and adjacent surfaces with a stiff non-metallic bristle brush.

(d) Clean the metering slots of the primary metering plug with the corner of a piece of brass shim stock 0.010 inch thick. Clean the metering slots and adjacent surfaces with a stiff non-metallic bristle brush.

(e) Clean the parts carefully to remove all lapping compound and other foreign material by SPOP 209 (refer to Section 70-21-00 in the Standard Practices Manual). Blow parts dry with filtered air.

C. Inspection

(1) Use a magnifying glass or microscope to examine the fuel nozzle body, main insert, secondary metering ring, and primary metering plug for signs of mechanical damage.

NOTE: Replace the full metering set if there are defects in a detail (except for the secondary metering ring). If a secondary metering ring has a defect, replace the ring with a new part and then adjust the applicable details to give satisfactory flows, if the other metering parts are in good condition. Refer to "Tailoring" in the Testing section.

(2) Examine the nozzle body, secondary metering ring, and main insert for signs of excessive erosion. This will show in the nozzle body as a dull gray color or swirl pattern worn into the wall of the swirl chamber below the discharge points of the metering slots. If excessive erosion is apparent, replace the metering set.

(3) Replace the primary metering plug spring if its free length is less than 0.400 inch.

(4) Replace the primary and secondary strainers.

R
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(5) Replace the retaining rings.

NOTE: It is not permitted to replace the details of the metering set (nozzle body, insert, and primary plug) individually, because each set is tested to give the necessary flow and spray characteristics. These details can only get cleaning and polishing operations, with minor filing of metering slots as specified in this section. If the test requirements are not in limits, it will necessary to replace the full metering set.

D. Repair

(1) Fuel Nozzle Stator (PN 695847 Typical) Worn OD Repair

See Figure 1124.

(a) Machine Index 2 diameter to remove wear. Remove the minimum material necessary to get the concentricity in limits.

R (b) Prepare the repair area for plasma coat by SPOP 170.
R Refer to Section 70-46-01 in the Standard Practices
R Manual.

(c) Apply PWA 53-18 plasma coat 0.015 inch thick maximum. Refer to Section 70-46-01 in the Standard Practices Manual.

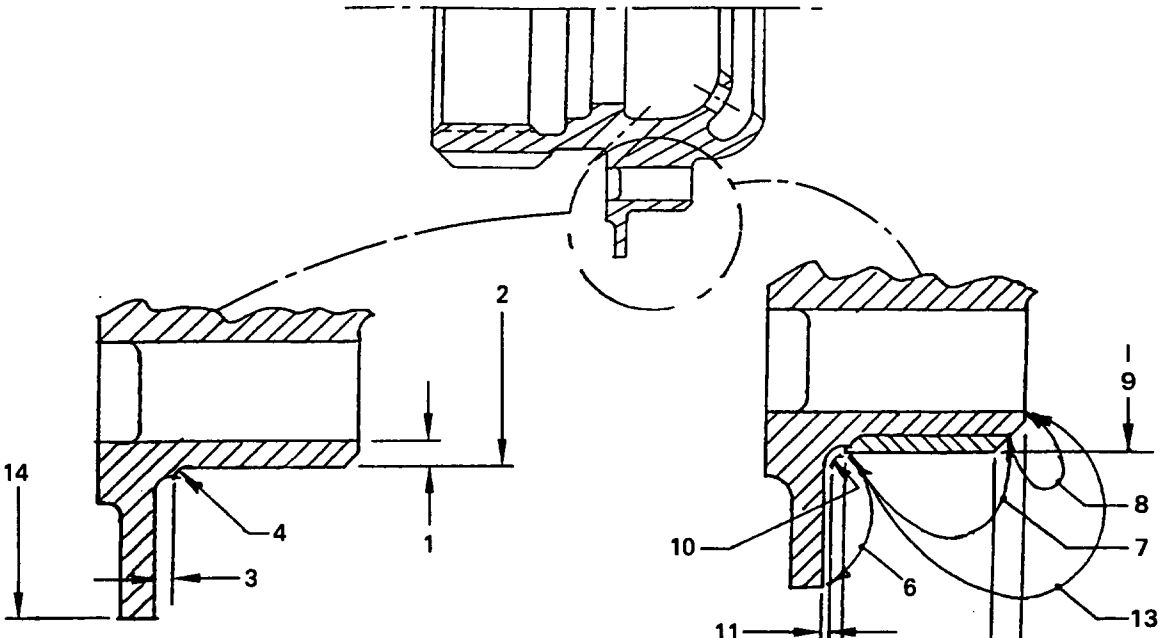
(d) Apply antigalling compound to Index 13 area by SPOP 146. Refer to Section 70-41-03 in the Standard Practices Manual.

(2) Fuel Nozzle Stator (PN 695847 Typical) Worn OD And Flange Surface Repair

See Figure 1125.

(a) Machine Index 2 diameter and Index 3 flange to remove wear. Remove the minimum material necessary to get the concentricity in limits.

R (b) Prepare the repair area for plasma coat by
R SPOP 170. Refer to Section 70-46-01 in the
R Standard Practices Manual.



VIEW A
PRIOR TO COATING

VIEW A
COATING AND FINAL
MACHINE

L-H3177 (1296)

R
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Fuel Nozzle Stator Worn OD Repair
Figure 1124

EFFECTIVITY -ALL

1. 0.027 Inch Minimum Wall Thickness After Damage Removal
2. 1.500 Inch Diameter Minimum, Concentric With Index 14 Diameter 0.010 Inch FIR Maximum.
3. 0.040 Inch Minimum
4. 0.015 - 0.040 Inch Radius
5. 0.040 - 0.050 Inch
6. No Coat Permitted
7. Coat This Area (See Text)
8. Coat Optional And May Be Incomplete
9. 1.526 - 1.530 Inch Diameter
10. 0.000 - 0.015 Inch Tool Radius
11. 0.003 - 0.015 Inch
12. Chamfer 0.020 - 0.040 Inch By 43 - 47 Degrees
13. Antigalling Compound Area (See Text)
14. Reference Diameter

Key To Figure 1124

(c) Apply PWA 53-18 plasma coat 0.015 inch thick maximum. Refer to Section 70-46-01 in the Standard Practices Manual.

(d) Apply antigalling compound to Index 13 area by SPOP 146. Refer to Section 70-41-03 in the Standard Practices Manual.

E. Assembly

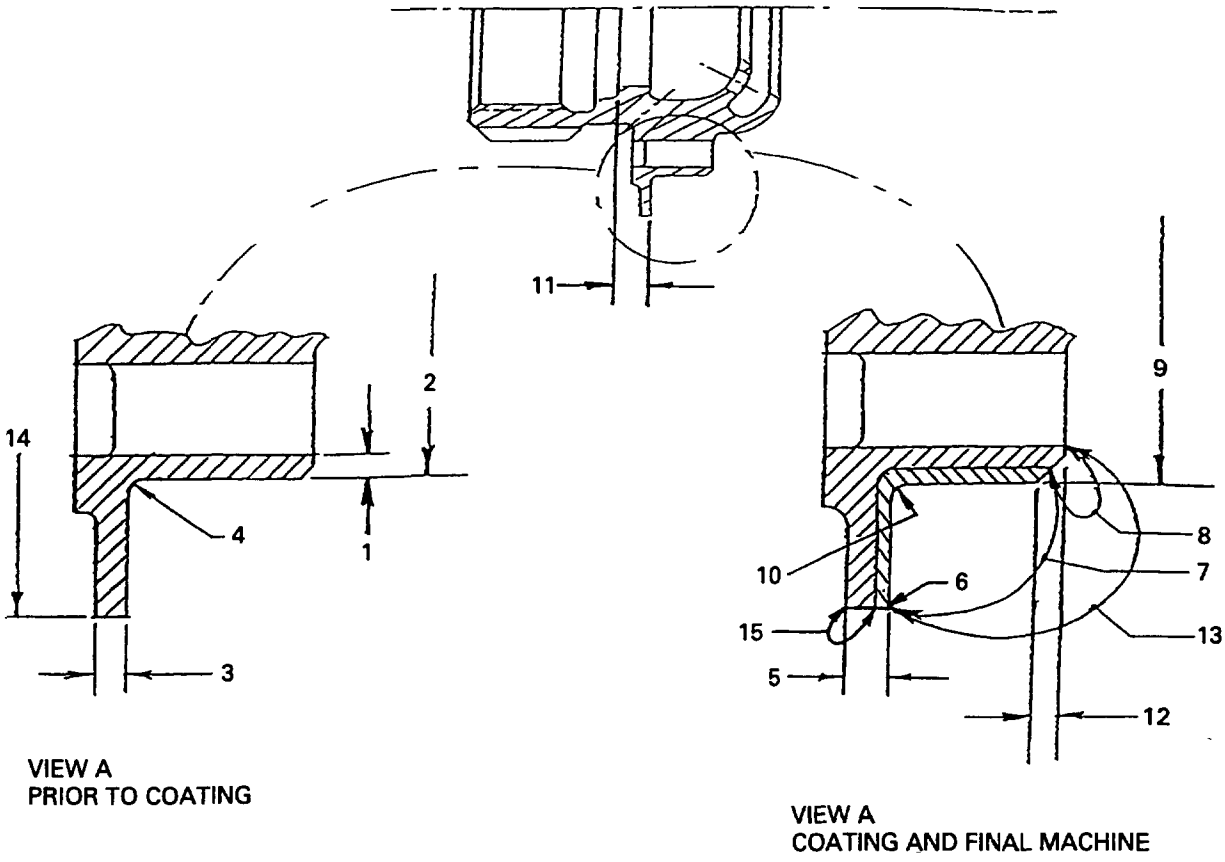
R (1) Before nozzle assembly, clean all parts in Stoddard
R Solvent (PMC 9001) which went through a 10-micron filter. Blow dry with filtered air. Parts, tools, work area, and hands must be free of dirt, dust, or other foreign material.

(2) Install the nozzle body in the Fuel Nozzle Holder.

(3) Install the secondary metering ring in its seat in the nozzle body (make sure that the metering slots are up).

(4) Install the secondary strainer in the counterbore in the nozzle body.

(5) Install the main insert (be careful to put it correctly on the secondary metering ring).



VIEW A
PRIOR TO COATING

VIEW A
COATING AND FINAL MACHINE

L-H3181 (1296)

R
R

Fuel Nozzle Stator Worn OD
And Flange Surface Repair
Figure 1125

EFFECTIVITY -ALL

1. 0.027 Inch Minimum Wall Thickness After Damage Removal
2. 1.500 Inch Diameter Minimum, Concentric With Index 14 Diameter 0.010 Inch FIR Maximum.
3. 0.030 Inch Minimum
4. 0.005 - 0.015 Inch Tool Radius
5. 0.046 - 0.048 Inch
6. Break Sharp Edges 0.003 - 0.015 Inch
7. Coat This Area (See Text)
8. Coat Optional And May Be Incomplete
9. 1.526 - 1.530 Inch Diameter
10. 0.015 - 0.040 Inch Radius
11. 0.141 - 0.151 Inch
12. Chamfer 0.020 - 0.040 Inch By 43 - 47 Degrees
13. Antigalling Compound Area (See Text)
14. Reference Diameter
15. No Coat Permitted

Key To Figure 1125

(6) Install the main insert retaining ring with Truarc No. 1 pliers.

NOTE: This is a bowed ring. Install it with the bow down (it must be possible to see the stamped number near the open ends of the ring).

(7) Use the Fuel Nozzle Holder (thumbscrew loosened) and a dial indicator to make sure that the sealing faces of the main insert and nozzle body are in the same plane 0.0005 inch maximum. If the sealing faces of these two parts are out of this limit, lap these faces with Norbide Abrasive, Grain Size 600 (boron carbide) to remove sufficient material to get the surfaces in limits. Clean the parts in PMC 9001 solvent and dry with compressed air. Do the seal face alignment check again after the parts are cleaned.

R

NOTE: Clean parts fully after all lapping operations.

(8) Install the primary metering plug in the main insert.

(9) Install the primary metering plug retaining spring on the stem of the plug.

(10) Install the primary strainer body on the open end of the plug retaining spring. Push down on the end of the strainer body (against the spring pressure) to get it into the bore of the main insert sufficiently to have the retaining ring groove show in the main insert.

Start the bent end of the retaining ring into its groove in the main insert at the part of the strainer body that is milled off for this operation. Continue to install the retaining ring (push down around its diameter until it is in position in its groove in the main insert).

NOTE: Be sure that the retaining ring locating diameter on the primary strainer body correctly holds the retaining ring in its groove in the main insert.

(11) Install the spacer sleeve, small end down, on the primary strainer body (put it at the base of the body).

(12) Install the primary strainer on the strainer body (put it in the counterbore of the spacer sleeve).

NOTE: If the outer end of the strainer is not flush with the shoulder face of the strainer body, the body is not in the correct position in relation to the primary strainer body retaining ring. To correct this condition, remove the primary strainer and the strainer sleeve, push down on the body, and turn the body until the body and the retaining ring are in the correct position.

(13) Install the primary strainer seat on the end of the strainer.

(14) Use Truarc No. E-12 E-Ring Applicator to install the primary strainer retaining ring in its groove in the strainer body.

F. Testing

(1) Purpose

(a) The purpose of the fuel nozzle calibration test is to make sure that the spray angle, alignment, and atomization are satisfactory, and that the nozzle flow rate through the primary and secondary orifices is in limits.

(2) General

R (a) Use fuel system calibration fluid (PMC 9041).

(b) Test fluid temperature at the nozzle entrance must be 25° - 29°C (77° - 83°F).

(c) Test pressures: Correct for instrument error if the error is more than ± 0.01 psi or more than ± 0.3 psi above 50 psi.

(d) Fluid flows: Correct for instrument error if more than 0.25 percent.

(e) Spray cone angle: Measure with a direct-reading protractor in the plane of the nozzle axis.

(3) Calibration

(a) If the overhauled nozzle is not in calibration limits, refer to the "Tailoring" paragraph for corrective actions which are available. After the overhauled nozzle is in limits, electric-etch the Letter R (for Repaired) on the flange of the nozzle body.

(4) Test procedure

(a) Spray pattern streaks - With 300 psi pressure applied to the primary and secondary, monitor the spray pattern for streaks (the inspection is better if it is possible to turn the nozzle slowly during the procedure). One or more high-contrast streaks (which are not possible to remove with a wiping operation) on the orifice is cause to reject the nozzle.

(b) Flow rates - Monitor the nozzle flow rate at the pressures in the table below. Rates not in limits are cause to reject the nozzle.

Primary Pressure (psig)	Secondary Pressure (psig)	Flow Range (pph)	Spray Angle (Degrees)
25	0	33.8 - 35.7	----
250	0	106.7 - 112.1	74 - 86
300	300	515 - 535	74 - 86

Fuel Nozzle Calibration Values

(c) Spray cone angle - Measure the spray cone angle during each of the flow check runs, at two positions approximately 90 degrees apart. Spray cone angle not in the limits specified is cause to reject the nozzle.

(d) Spray cone alignment - Make sure that the spray cone is aligned with the nozzle axis during each of the flow check runs at two positions approximately 90 degrees apart. A spray cone that is eccentric (or "skewed") more than 5 degrees total variation or that has spray outside the specified spray cone angle is cause to reject the nozzle.

(5) Tailoring

(a) If the spray of the overhauled nozzle has streaks or if the fluid flow is out of limits, clean and polish the metering set parts as specified above. Discard the metering set if cleaning and polishing does not correct the streaks. If cleaning and polishing does not bring nozzle flow into limits, it will be necessary to adjust (or "tailor") the metering set parts to increase the flow.

(b) To increase fluid flow from the primary system:

1 Remove the primary metering plug and hold it tightly between the thumb and forefinger, the spring guide (stem) toward the operator, with one of the metering slots at the right of the centerline of the plug.

2 Use a knife-edge fine India stone and, with short strokes, stone the full length of the left-hand top edge of the metering slot.

NOTE: Do not let the stone touch the opposite or right-hand side of the metering slot during this operation.

R 3 Clean the metering plug in PMC 9001 solvent and blow dry with clean compressed air.

4 Assemble the nozzle.

5 Do the fluid flow test on the nozzle.

(c) To increase fluid flow from the secondary system:

NOTE: To do this operation it will be necessary to get a fine India stone ground to the cross-section form of a small trapezoid, with a base slightly narrower than the width of a secondary metering slot, slope sides, and a top narrower than the base. The width of this trapezoid-shape stone must be approximately 3/16 inch.

1 Remove the secondary metering ring and hold it tightly between the thumb and forefinger, the metering slots up.

2 With the trapezoid-shape fine India stone (see above), put the base of the stone flat against the bottom of one of the metering slots and, with short, firm strokes, stone the bottom of the slot. Turn the metering ring 180 degrees, and with the same procedure, stone the opposite metering slot.

NOTE: Two metering slots that get this stone procedure will usually increase the flow sufficiently for another test.

R 3 Clean the metering plug in PMC 9001 solvent and blow dry with clean compressed air.

4 Assemble the nozzle.

5 Do the fluid flow test on the nozzle.

(d) To decrease fluid flow from the primary system:

1 Remove the primary metering plug and hold it tightly between the thumb and forefinger, the spring guide (stem) toward the operator, with one of the metering slots at the right of the centerline of the plug.

2 Use a knife-edge fine India stone and, with short strokes, stone the right-hand edge (or corner) of the metering slot at its junction

with the small end of the plug (furthest from the operator).

NOTE: The knife-edge stone is called Fine India stone and is available from the Norton Pike Company of Littleton, NH. The stone designation is FT-134, its size is 4 by 9/16 by 3/16 inch, and its grit size is measured by the Moh scale.

NOTE: Do not let the stone touch the opposite or left-hand side of the metering slot during this operation.

R 3 Clean the metering plug in PMC 9001 solvent and blow dry with clean compressed air.

4 Assemble the nozzle.

5 Do the fluid flow test on the nozzle.

(e) To decrease fluid flow from the secondary system:

1 Remove the secondary metering ring and (on a good lapping plate), with Norbide Abrasive Grain Size 600 (boron carbide) lapping compound, lap the surface of the ring on which the metering slots are ground. Use a figure-eight lapping movement and keep the face that is lapped parallel to the opposite face.

NOTE: Three or four-inch figure-eight strokes are usually sufficient to decrease fluid flow to test limits. After the slot face is lapped, polish the inside diameter of the face with a Craytex rod to a radius of 0.003 - 0.005 inch. To do this, hold the ring, lapped face out, in a rotating collet.

R 2 Clean the metering plug in PMC 9001 solvent and blow dry with clean compressed air.

3 Assemble the nozzle.

4 With the Fuel Nozzle Holder (thumbscrew loosened) and a standard dial indicator, make sure that the sealing faces of the main insert and nozzle body are in the same plane 0.0005 inch maximum. If the sealing faces are not in the 0.0005 inch tolerance, use the lapping plate to remove the necessary amount of material from either part as shown in the fixture.

NOTE: Clean all parts fully after a lapping operation.

5 Do the fluid flow test on the nozzle.

R G. Table of Limits

R (1) Refer to Figure 1126 for fits, clearances, and torques
R applicable to the fuel nozzle assembly.

R (2) Refer to Section 72-00-00, Table of Limits for general
R notes related to reference numbers, units of measurement,
R and symbols used in Tables of Limits.

R REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
R (a)		Fuel Nozzle Dimensional Limits					
R	92	Fuel Nozzle Primary Strainer Body Sleeve	.247	.248			
R		Fuel Metering Nozzle	.249	.251	.001	.004	.004
R	93	Fuel Nozzle Primary Strainer Body	.2465	.2485			
R		Fuel Metering Nozzle	.2490	.2510	.0005	.0045	.0045
R	95	Fuel Nozzle Primary Strainer Body (Small Diameter)	.199	.203			
R		Primary Strainer Sleeve	.204	.208	.001	.009	.009
R (b)		Fuel Nozzle Assembly Torques					
R	364	Fuel Nozzle Air Swirl Guide Nut			250.0	275.0	
R (c)		Fuel Nozzle Internal Spring Load Limits					

R	REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
R	404		Fuel Nozzle Primary Strainer Body Spring at 0.368 inch			1.75	2.25	1.65

8. Fuel Pressurizing And Dump Valve

NOTE: Refer to Tool Group A7.

A. Disassembly

See Figure 1127.

NOTE: Remove and discard all seals and packings during disassembly.

(1) Remove the cap from the fuel pressure valve chamber cover, and the dump valve plug from the dump valve chamber cover.

(2) Attach the spring compressor to the thread portion of the pressure valve chamber cover.

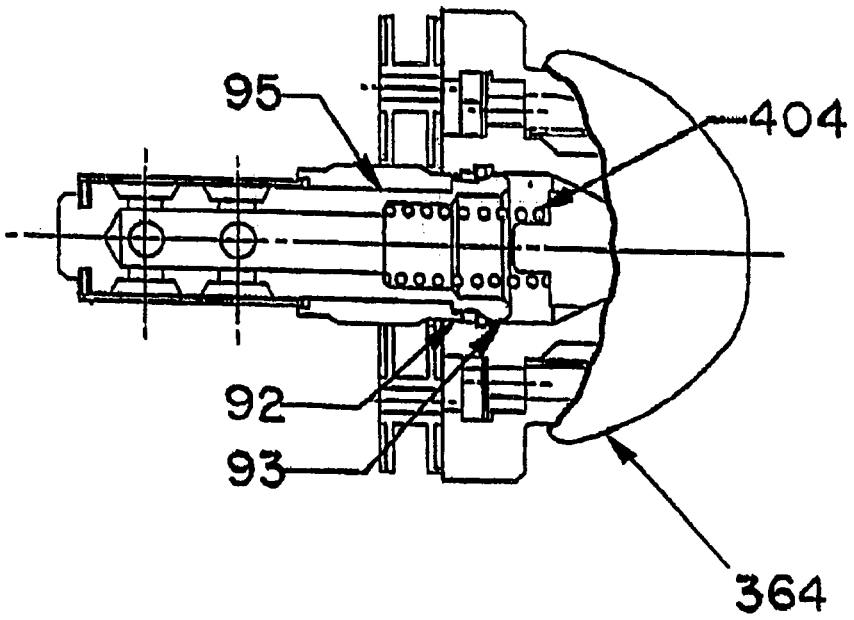
(3) Turn the handle of the spring compressor in a clockwise direction (engage the pusher in the bevel-groove hole in the dump valve chamber cover).

(4) After the handle of the spring compressor is tightened, remove the nuts and washers that attach the dump valve chamber cover to the housing.

(5) Turn the handle of the spring compressor in a counterclockwise direction (this lets the pressurizing valve spring push off the cover). Remove the compressor and cover.

(6) If the dump valve has a plain seal, remove the snap ring, seal ring, seal spring, and valve seal. For valves with chevron seals, remove the snap ring, washer, and chevron seal.

(7) Remove the fuel pressure adjusting bolt from the fuel pressure cover. This will release spring pressure and make removal of the fuel pressure valve chamber possible.



L-H8038 (0207)

(8) Remove the bolts that attach the pressure valve chamber cover to the housing and remove the cover.

(9) Remove the adjusting spring seat, spring, fuel pressurizing valve, pivot pin, and spring seat.

(10) Install the Liner Puller in the ID of the liner with the three pins in the holes of the liner. Make sure that the pins will stay in the liner, then remove the liner with knocker action.

B. Cleaning

R (1) Remove grease from parts by SPOP 209. Refer to Section
R 70-21-00 in the Standard Practices Manual.

R (2) Clean all parts and the screen by SPOP 203. Refer to
R Section 70-21-00 in the Standard Practices Manual.

C. Inspection

(1) Examine the packing grooves for burrs, nicks, or scratches which could cause packings to not seal correctly.

(2) Examine all threaded parts for thread damage.

(3) Examine all sealing surfaces for nicks and scratches.

R (4) Measure all springs for correct load. Refer to
R Table Of Limits in this paragraph.

(5) Examine the dump valve piston liner and pressurizing valve piston and liner sliding surfaces for scores, galling, pickup, nicks, or scratches.

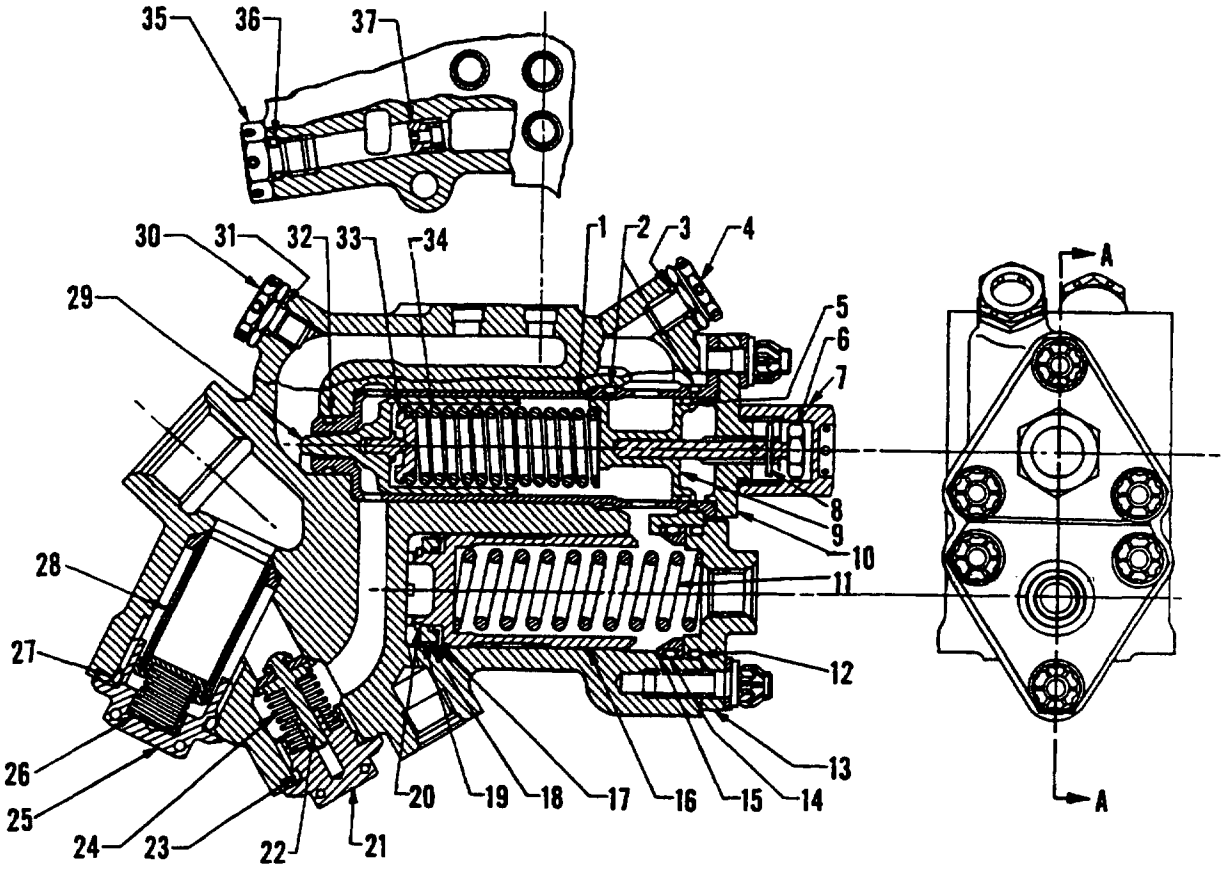
D. Repair

(1) Valve Body Stud Replacement

See Figure 1128.

(a) Replace studs in the valve body as necessary by
R SPOP 416. Refer to Section 70-00-00 in the
R Standard Practices Manual.

(2) Liner Blend Repair (PN 384240)



SECTION A-A

L-08765 (0000)

R
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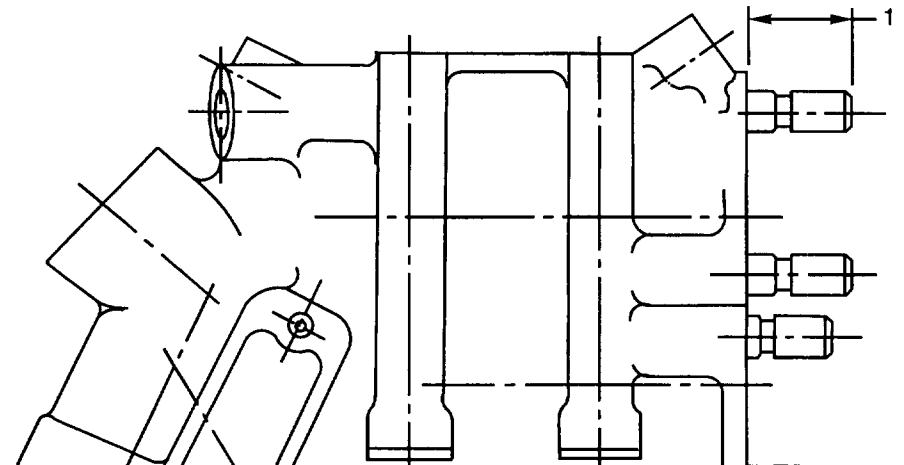
Fuel Pressurizing And Dump Valve
Figure 1127

1. Liner
2. Liner Packings
3. Packing
4. Primary Pressure Plug
5. Packing
6. Fuel Pressurizing Valve Spring Adjusting Bolt
7. Fuel Pressurizing Valve Chamber Cap
8. Pin
9. Outer Spring Seat
10. Fuel Pressurizing Valve Chamber Cover
11. Fuel Dump Valve Spring
12. Cover Packing
13. Fuel Dump Valve Chamber Cover
14. Valve Seat Packing
15. Valve Seat
16. Fuel Dump Valve
17. Seal
18. Spring
19. Ring
20. Spiral Retaining Ring
21. Fuel Check Valve Guide Plug
22. Fuel Check Valve Assembly
23. Seal
24. Spring
25. Inlet Fuel Strainer Plug
26. Spring
27. Seal
28. Inlet Fuel Strainer
29. Inlet Pressurizing Valve Assembly
30. Secondary Pressure Plug
31. Packing
32. Liner Packing
33. Inner Spring Seat
34. Fuel Pressurizing Valve Adjusting Spring
35. Restrictor Port Plug
36. Seal
37. Restrictor

Key To Figure 1127



L-08774 (0000)
PW V

Index No.	Part Name	Units Per Assembly	Projection Length (Inches)
1.	Stud	3	0.790 - 0.810
2.	Stud	3	0.660 - 0.680

Fuel Pressurizing And Dump Valve
Body Stud Replacement
Figure 1128

(a) Remove scratches and wear marks from Index 2 area in the figure by SPOP 533 blend repair. Refer to Section 70-45-00 in the Standard Practices Manual. After the area is blend repaired and polished, Index 2 diameter must not be more than 0.9303 inch and the surface finish must be 6AA maximum. If these are not in limits, go on to the plate repair in step (3).

(3) Liner Plate Repair (PN 384240)

See Figure 1129.

NOTE: The liner is stainless steel with a hardness of more than RC40.

(a) Prepare Index 2 diameter by one of these:

1 Remove the plate by SPOP 22. Refer to Section 70-44-01 in the Standard Practices Manual.

R
R
2 Grind Index 2 diameter to 0.943 inch maximum, concentric with Index 4 diameter 0.001 inch FIR maximum.

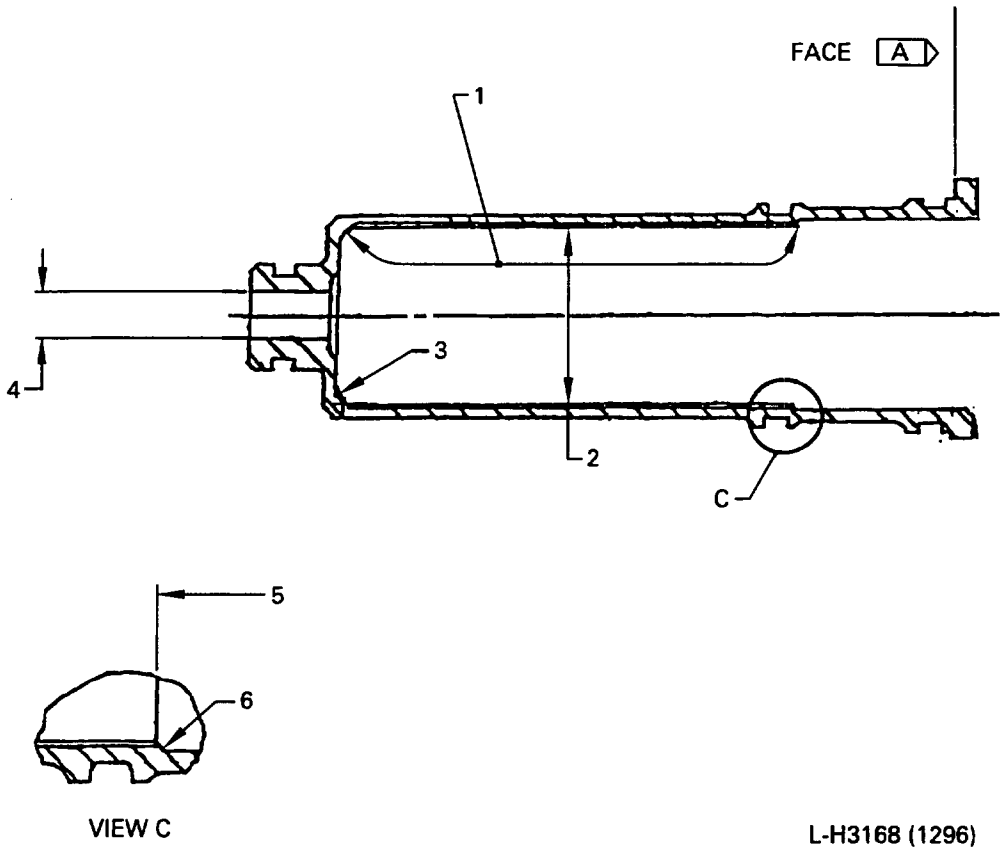
(b) Apply chromium plate by SPOP 22 to a sufficient thickness to machine to the finish diameter. Refer to Section 70-44-01 in the Standard Practices Manual.

(c) Machine Index 2 diameter to the dimensions shown. Surface finish must be 6AA maximum.

(4) Valve Assembly Blend Repair (PN 384249 or 384241)

See Figure 1130.

(a) Remove scratches and wear marks from Index 5 diameter in the figure by SPOP 533 blend repair. Refer to Section 70-45-00 in the Standard Practices Manual. After the area is blend repaired and polished, Index 5 diameter must not be more than 0.9283 inch and the surface finish must be 6AA maximum. If these are not in limits, go on to the plate repair in (5).



VIEW C

L-H3168 (1296)

1. Plate Area
R 2. 0.9297 - 0.9303 Inch Diameter, Concentric With Index 4 Diameter 0.0005 Inch FIR Maximum
3. 0.078 - 0.109 Inch Radius
R 4. Reference Diameter
R 5. 0.790 - 0.820 Inch To Face A
R 6. 0.109 - 0.141 Inch Radius

Key To Figure 1129

(5) Valve Assembly Plate Repair (PN 384249 or 384241)

See Figure 1130.

NOTE: The valve material is stainless steel with a hardness of more than RC40.

(a) Prepare Index 5 diameter by one of these:

1 Remove the plate by SPOP 22. Refer to Section 70-44-01 in the Standard Practices Manual.

R 2 Grind Index 5 diameter to 0.915 inch maximum, concentric with Index 6 diameter 0.001 inch FIR maximum.

(b) Apply chromium plate by SPOP 22 to a sufficient thickness to machine to the finish diameter. Refer to Section 70-44-01 in the Standard Practices Manual.

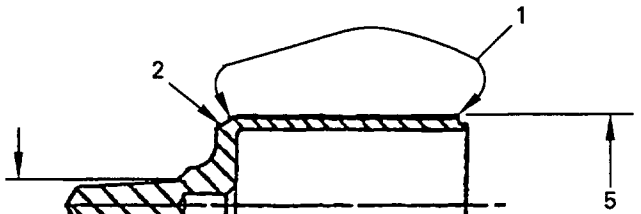
(c) Machine Index 5 diameter to the dimensions shown. Surface finish must be 6AA maximum.

R (6) Valve Assembly Machining Repair (PN 384249 or 384241)

R See Figure 1131.

R (a) Machine the conical sealing surface on the valve as
R necessary to remove wear grooves where shown in
R the figure (dimensions shown are after machining).

R (b) Remove scratches and marks which are a result of
R machining in step (a) from Index 4 diameter in the
R figure by SPOP 533 blend repair. Refer to Section
R 70-45-00 in the Standard Practices Manual.



L-H3169 (1296)

1. Plate Area
2. Chamfer (Optional Plate Area)
3. 0.040 - 0.060 Inch
4. 30 Degrees ± 2 Degrees
5. 0.9283 - 0.9287 Inch Finish Diameter, Concentric With Index 6 Diameter 0.001 Inch FIR Maximum
6. Reference Diameter

Key To Figure 1130

E. Assembly

See Figure 1132.

NOTE: Refer to Tool Group A6A.

R NOTE: To be sure that valve leakage is in bench limits at subsequent bench checks, lap all valves and valve seats (with a minimum of 360-degree relative rotation) with aluminum oxide lapping compound, 600 - 800 grain size.

(1) Install the seal and plug in the secondary pressure boss.

(2) Install the restrictor, seal, and plug in the restrictor boss.

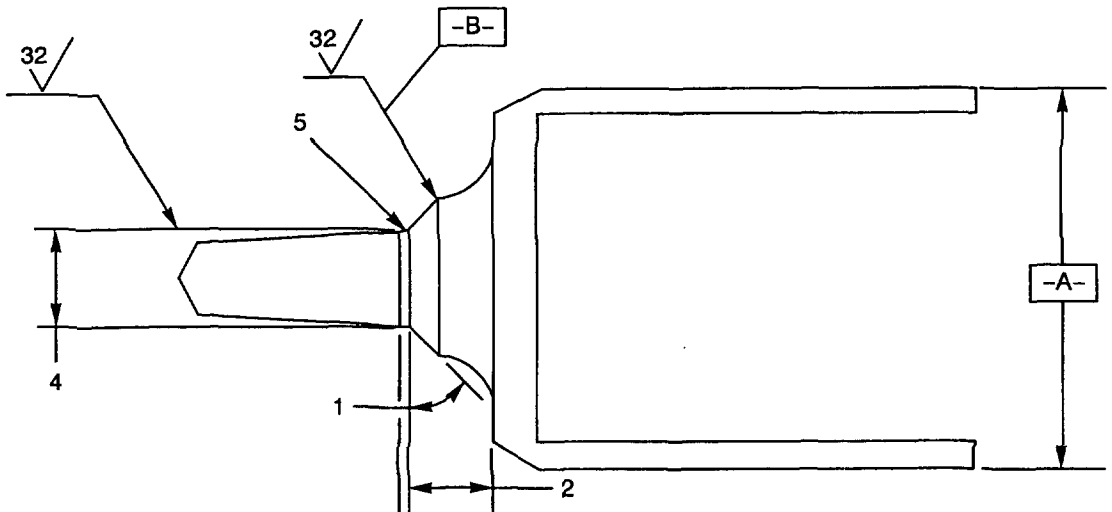
(3) Install the strainer, spring seal, and plug in the inlet fuel strainer boss. Torque the plug to 125 - 175 lb-in.

(4) Install the valve assembly, spring, seal, and plug in the fuel check valve boss.

(5) Install three seals on the fuel pressurizing valve chamber liner and install the liner, fuel pressurizing valve assembly, inner spring set, fuel pressurizing valve adjusting spring, and outer spring seat and seal in the fuel pressurizing valve chamber.

(6) Install the fuel pressurizing valve chamber cover on the chamber studs and attach with three washers and nuts.

(7) Thread the fuel pressurizing valve spring adjusting bolt into the chamber cover until it is at the bottom, then thread it back out four full turns. Safety the bolt with the pin.



L-H7962 (1006)
PW V

1. 45 Degrees ± 30 Minutes
2. 0.200 Inch Minimum
3. 0.222 - 0.228 Inch (Reference)
4. 0.2470 - 0.2475 Inch Diameter, Concentric With Diameter A
   0.001 Inch FIR Maximum
5. 0.003 Inch Radius Maximum

(8) Assemble the fuel dump valve assembly: Install a new seal, followed by the seal spring, seal ring, and retaining ring. If the dump valve will get chevron seals, (not the plain-type seal), assemble a new extension garter spring chevron seal and install it on the valve as follows:

(a) Install the expansion strip through the expansion spring as shown in Figure 1132, step (1).

(b) Hold one end of the expansion spring to prevent movement and unwind the other end three full turns (see step 2 in the figure). Then let the ends turn freely into one another to get the condition shown in the figure, step (3).

(c) Install the expansion spring and strip in the coil spring inserter. See step (4) in the figure.

(d) At the same time, install and turn the plug clockwise against the spring to put the coils sideways. Install the chevron packing on the plug and put the expansion spring and strip into the chevron packing (turn the coil spring inserter up side down and push down on the base). See steps (5) and (6) in the figure.

NOTE: Do not let the assembled packing, spring, and strip be not installed for a long time, because the spring can push out the edge of the packing. If this occurs, install the spring and strip again before the chevron seal is installed in the valve assembly.

(e) Install the chevron seal on the valve with the packing against the shoulder.

(f) Put the washer against the seal spring and hold it in position with the snap ring.

(g) Put the valve (with its seal) in the pilot sleeve.

(9) Install the dump valve, spring, and dump valve seat and seal in the fuel dump valve chamber with the pilot sleeve.

(10) Put the dump valve chamber cover and cover seal on the dump valve spring.

(11) Attach the Spring Compressor to the threaded portion of the pressurizing valve chamber cover.

(12) Put the pusher into the chamfered hole in the chamber cover and turn the handle in a clockwise direction until the cover goes correctly on to the dump valve housing.

(13) Safety the chamber cover with nuts and washers and disconnect the spring compressor.

(14) Install the fuel pressurizing valve chamber cap.

(15) Install the plug and seal in the primary pressure boss.

F. Testing

(1) Valve Assembly types:

(a) Group I - PN 420310 and 586982

(b) Group II - PN 433689

(2) Equipment

(a) Test fluid, PMC 9041

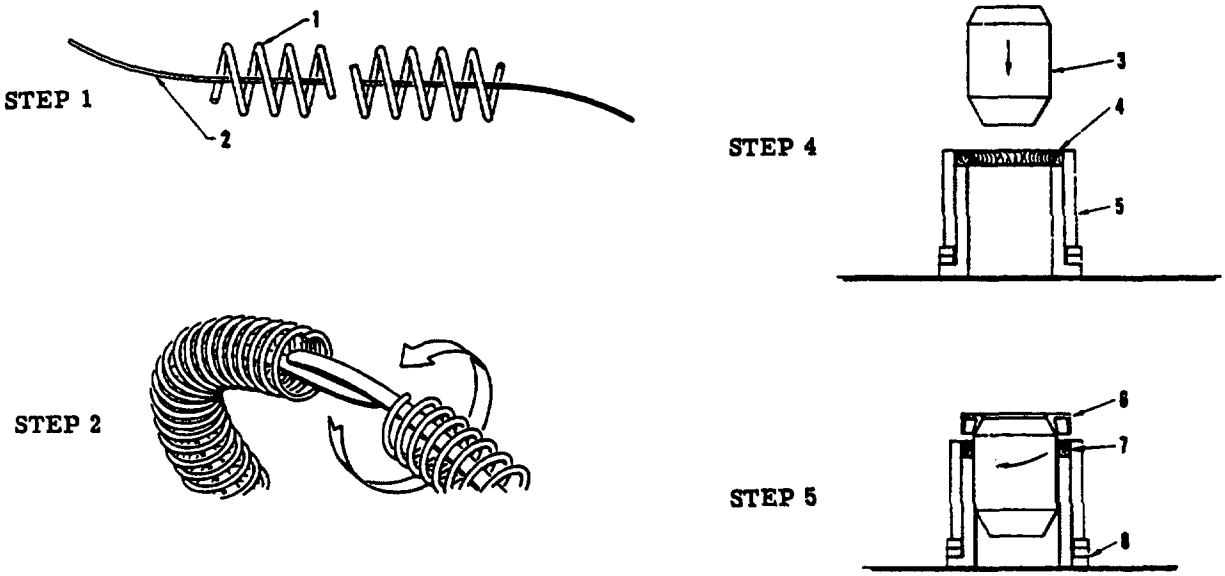
(b) Flow bench that can measure 4500 phr of test fluid at pressures as high as 600 and 1000 psig at no-flow conditions.

(c) Heat exchanger to keep test fluid at 24° - 29°C (75° - 85°F).

(d) Static Head Adapter (refer to Tool Group A7)

(e) Holding Fixture with orifices (to simulate engine fuel manifold and nozzles). Calibration of this fixture will be necessary to get these flow requirements:

NOTE: It will be necessary to calibrate orifices each time the test equipment is set up to do pressurizing and dump valve tests and after each fifth test run with the same equipment. The orifices must be in the block and the valve installed on the block during calibration. Measure the primary and secondary pressure drops from the valve pressure taps to the common discharge which



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1. Spring (PN 586989)
2. Strip (PN 586987)
3. Plug
4. Expansion Spring And Strip
5. Coil Spring Inserter (HS 9072)
6. Packing (PN 586988)
7. Coils Sideways
8. Base
9. Base Inverted
10. Expansion Spring And Strip In Chevron Packing

R
R

Fuel Pressurizing And Dump Valve
Dump Valve Chevron Seal Assembly
Figure 1132

R

is not more than 20 psig (the common discharge is the fitting where the primary and secondary fuel flows are combined). Put caps on the valve dump signal and overboard drain fittings during the calibration of the two orifices. For calibration of the primary orifice, put a cap on the secondary entrance to the common discharge, then measure the primary fuel flow. For calibration of the secondary orifice, flow through the two orifices but measure flow through the secondary orifice only. Connect primary fuel flow to bypass the common discharge and the flowmeter.

Orifice	Fuel Flow, phr	Fuel Pressure Drop, psi
Primary	750	207 ± 2
Secondary	3000	280 ± 5

Fuel Pressurizing And Dump Valve
Flow Bench Requirements

(3) Instrumentation necessary for test

Measurement	Operating Range	Accuracy
Fluid Flow	200 - 4500 phr	± 1%
Inlet Pressure	0 - 600 psig	± 3 psi
Primary Pressure	0 - 400 psi	± 2 psi
Secondary Pressure	0 - 400 psi	± 2 psi
Dump Signal Pressure	0 - 300 psig	± 2 psi
Dump Signal Pressure	301 - 1000 psig	± 10 psi
Common Discharge Pressure	0 - 20 psig	± 2 psi

Fuel Pressurizing And Dump Valve
Instrumentation Requirements

(3) Test procedure

(a) Leakage and dump valve operation check

1 Install the valve on the Holding Fixture in the same position as on the engine. Connect the test fluid source to the inlet and secondary pressure tap. Put caps on the primary and secondary discharge lines and connect the primary pressure tap to the gage. Do a leakage check for two minutes at each condition in the table below. Do checks in the sequence shown, and for each check set the dump signal pressure first.

Primary Pressure (psig)	Dump Signal Pressure (psig)	Overboard Drain Maximum Flow
Group I only		
15	90	5 cc/minute
60	130	1 cc/minute

NOTE: Set the dump signal pressure and primary pressure in the sequence shown. Set the dump signal pressure first. Do a leakage check for two minutes.

Group II only		
15	80	5 cc/minute
60	120	1 cc/minute
Group I and II		
600	600	Record
600	1000	No leakage permitted

Fuel Pressurizing And Dump Valve
Instrumentation Requirements

2 Connect the overboard drain to the flowmeter. Set a primary pressure more than 40 psi and an overboard drain pressure five psi lower than the primary pressure. Apply a dump signal pressure 65 psi higher than the overboard drain pressure for Group I, 110 psi higher than the overboard drain pressure for Group II, and 50 psi higher than the overboard drain pressure for Group III. Overboard drain flow must be 300 phr minimum.

NOTE: This is the only test condition in the component calibration schedule in which the overboard drain pressure is permitted to be higher than ambient. Do not use fittings or lines smaller than No. 4 tubing or longer than three feet (these

can decrease the flow through the overboard drain passage).

(b) Inlet check valve leakage check

1 With the Static Head Adapter on the valve inlet, and the dump signal pressure at zero, increase the inlet pressure until fluid flows out of the overboard drain, then decrease the inlet pressure to 12 inches static head (measured from the face of the valve to flush with the block face). Measure the leakage past the inlet check valve at the overboard drain port. Leakage must not be more than 10 cc/min.

(c) Dump valve chevron seal leakage check

1 Supply 40 psig dump signal pressure to the dump valve. Remove the static head of test fluid, loosen the inlet screen plug, and drain the fluid from the valve. Do not drain the dump valve chamber. Record leakage past the chevron seal out of the overboard drain. Overboard drain leakage must not be more than 10 cc/minute.

(d) Pressurizing valve set point

1 Set 1200 phr flow with fuel inlet pressure to the valve as a dump signal. Record the primary pressure and pressure at the common discharge point for primary and secondary flow.

NOTE: Make sure that the secondary passages are filled before leakage is measured.

a Limits: The "As Received" primary differential pressure (primary minus common discharge pressure) must be 232 - 275 psi. If not in limits, or if the valve is in initial calibration, adjust the valve to give primary differential pressure of 250 - 258 psi.

(e) Disconnect the secondary discharge line at the orifice block and common discharge. Install a cap on the secondary connection to the common discharge and keep the secondary port of the orifice block open. Set 300 psi dump signal pressure, 600 phr

flow, and measure the leakage out of the secondary discharge of the orifice block. Leakage must not be more than three cc/minute.

NOTE: Lapping of the valve against the liner is permitted to decrease secondary leakage to less than the limit. If this is done, it will be necessary to do the test procedures in step (3) again.

(f) Pressurizing valve schedule

1 Set fluid flows in the sequence below. If fluid flow decreases, do the settings again. If the fluid flow fluctuates, adjust the flow until the applicable set point is the average of the minimum and maximum flows. Set 200 psig dump signal pressure at 600 pph. Use fluid inlet pressure to the valve as the dump signal for all other flows.

Primary Differential Pressure (psi)

Total Fuel Flow (pph)	Setup Limits	As Received Limits
600	110 - 131	110 - 131
1000	225 - 255	215 - 265
1200	242 - 265	232 - 275
2000	265 - 315	250 - 330
4200	300 - 345	290 - 355

Fuel Pressurizing And Dump Valve
Pressurizing Valve Schedule

2 Record (for each test point):

a The pressure at the valve primary pressure tap

b The pressure at the valve secondary tap

c The fuel inlet pressure

d The common discharge pressure

R
R

e Total flow through the valve.

3 Limits:

a "As Received" limits are applicable unless adjustment is made to step (d) (pressurizing valve set point) or step (f) (pressurizing valve schedule) (where "setup" limits are applicable). If an adjustment is made in step (f) (pressurizing valve schedule), it will be necessary to do step (e) (secondary discharge leakage check) again.

4 The primary differential pressure (primary pressure minus common discharge pressure) for flows that increase and decrease must be ±10 psi at the same flow and in the limits shown in the table.

5 For flows that fluctuate, the difference between maximum and minimum flows must be less than 200 pph. Total difference between maximum and minimum primary pressures must be less than 40 psi, and the average primary pressure must be in the limits shown in the table.

6 Inlet pressure must not be more than 470 psig at all fluid flows.

7 At all fluid flows, there must be no external leakage except from the overboard drain.

R G. Table of Limits

R (1) See Figure 1133 for fits, clearances, and other limits
R applicable to the fuel pressurizing and dump valve assembly.

R (2) Refer to Section 72-00-00, Table of Limits for general
R notes related to reference numbers, units of
R measurement, and symbols used in Tables of Limits.

R REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
R (a)		Fuel P&D Valve Dimensional Limits					

REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
	570	Fuel Pressurizing Valve	.9283	.9287			
		Liner	.9297	.9303	.001	.002	.0025
	573	Fuel Dump Valve	1.048	1.049			
		Body	1.050	1.051	.001	.003	.004
	576	Fuel Check Valve					
		Guide	.122	.126			
		Plug	.136	.140	.010	.018	.024
	577	Fuel Dump Valve (PN 397228 only)	.674	.675			
		Seal Ring	.676	.678	.001	.004	.005
	578	Fuel Pressurizing and Dump Valve Inlet Strainer					
		Spring Seat	.803	.805			
		Plug	.809	.811	.004	.008	.010
R	580	Fuel Pressurizing Valve					
R		Liner	1.045	1.047			
R		Body	1.049	1.051	.002	.006	.010
	(b)	Fuel P&D Valve Assembly Torques					
	827	Fuel P&D Valve Body Plug			60	70	
	(c)	Fuel P&D Valve Internal Spring Load Limits					
	866	Fuel Pressurizing Valve Spring					
		at 1.893 Inch			13.000	15.000	12.300
		at 1.334 Inch			31.6875	35.6875	30.062
		at 1.334 Inch (JFTD12A-5A)			31.688	35.688	30.062
	867	Fuel Dump Valve Spring (PN 397229)					
R		at 2.300 Inches			38.6250	42.1250	36.875
		at 2.017 Inches			61.6875	68.6875	54.500
		Fuel Dump Valve Spring (PN 433688)					
		at 2.300 Inches			74.750	78.750	
		at 2.000 Inches			100.000	108.000	
	868	Fuel Check Valve Spring					
		at 0.600 Inch			1.875	2.125	1.750

	REF. NO.	FIG. NO.	DESCRIPTION	DIMENSIONS MIN	DIMENSIONS MAX	LIMITS MIN	LIMITS MAX	REPLACE IF OVER
	869		Fuel P & D Valve Inlet Strainer Spring					
			at 0.520 Inch			5.125	5.375	5.000
R			at 0.395 Inch			7.500	8.000	7.250

H. Preservation and Storage

(1) Use Exxon Turbo Oil No. 10 or equivalent to flush the valve assembly. If flushing oil, drained from components, is used again, the viscosity of the oil must not decrease below nine centistokes at 38°C (100°F). Do a check of laboratory samples once a week or less to monitor for dilution and contamination, unless no components were preserved since the previous checks. Oil must go to a pressurizing and dump valve through a two - ten micron filter.

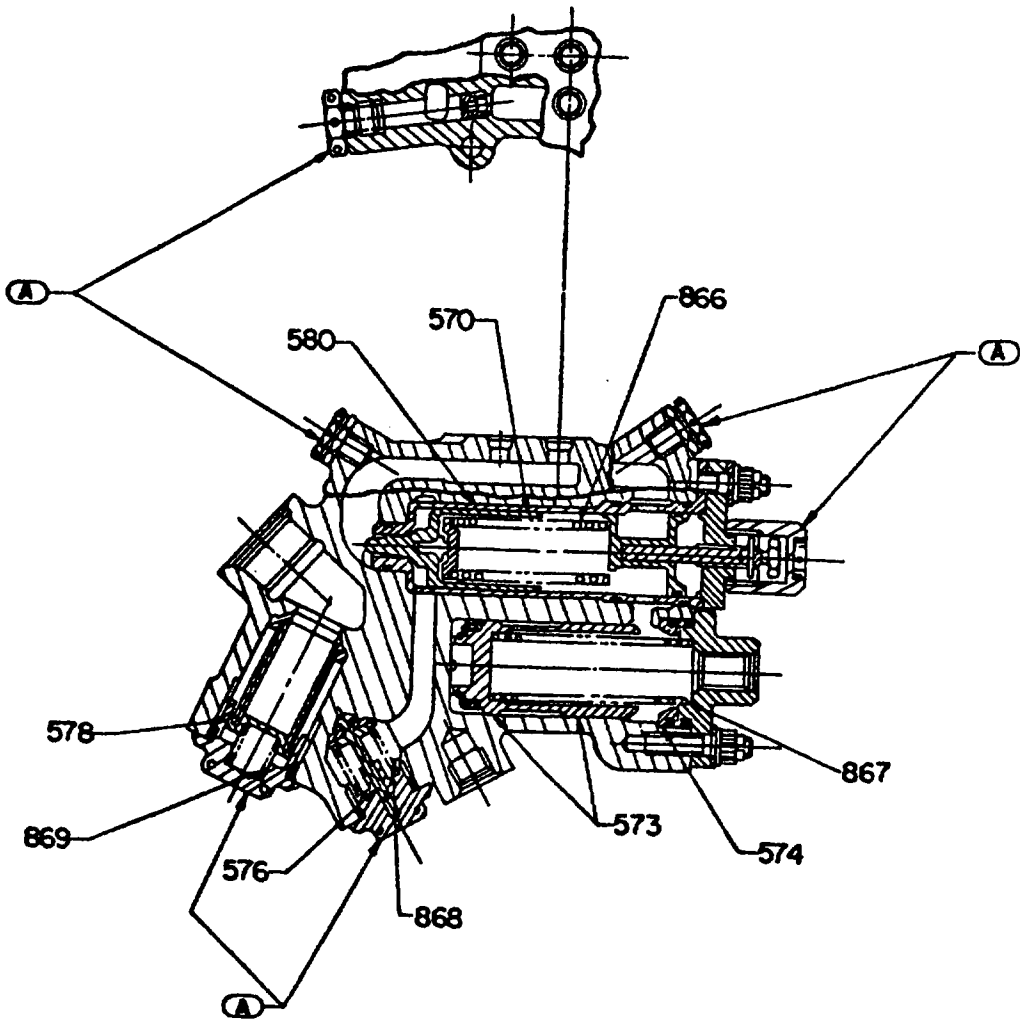
(2) After bench tests, examine threaded connections, sealing surfaces, etc. If the estimated storage period will be longer than 21 days, drain and flush the assembly as follows:

(a) Drain as much fluid from the valve as possible.

(b) With flushing oil connected to the inlet, flow flushing oil under 70 - 80 psig inlet pressure until the flushing oil flows out of the primary discharge, secondary discharge, and overboard drains for one minute.

(c) Connect the oil source to the dump signal port and keep 150 psig pressure on the dump signal for one minute.

(d) Remove all pressure and test fittings used during the flushing operation and drain flushing oil from all ports. Put caps or plugs on all ports.



A LOCKWIRE THESE PARTS TOGETHER

L-H8041 (0207)